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ERRATA

Page 26 line 7 for 'Kargopolova' read 'Kargapolova'
158 10 after 'scurf' insert 'of potato'
160 49 for 'gumming disease' read 'gomziekte [leaf scald]'
176 lines 36 and 40 for '*Dactyella*' ,, '*Dactylella*'
220 line 35 for 'Ayres' ,, 'Ayers'
231 11 ,, '497' ,, '479'
232 20 ,, '*Cunninghamiella*' ,, '*Cunninghamella*'
241 42 ,, '1936' ,, '1937'
249 25 ,, 'of the' ,, 'to the'
298 49 ,, '*ehrenbergii*' ,, '*ehrenbergi*'
302 26 ,, '42' ,, '427'
325 47 insert '?' before '*Lambertella*'
350 lines 2 and 5 for 'spruce' read 'silver fir'
line 3 ,, 'firs' ,, 'spruces'
353 lines 2 and 7 ,, 'fir' ,, 'spruce'
366 lines 7 and 10 ,, 'copper' ,, 'iron'
377 line 28 for '*relianum*' ,, '*reilianum*'
381 27 ,, 'Lee (L. R.)' ,, 'Lee (L. E.)'
428 29 ,, 'Findlay (W. K. P.)' ,, 'Findlay (W. P. K.)'
453 41 ,, 'hyphae' ,, 'strands'
477 41 ,, 'Davies (F. A.)' ,, 'Davies (F. R.)'
492 20 ,, 'Cummins (J. B.)' ,, 'Cummins (G. B.)'
495 45 ,, 'xv' ,, 'xiv'
546 48 ,, '*oliviae*' ,, '*olivae*'
566 46 ,, 'Trotter (H.)' ,, 'Trotter (A.)'
570 40 ,, 'Yuasa (K.)' ,, 'Yuasa (A.)'
595 30 ,, '1936' ,, '1937'
599 lines 2 and 5 for 'millet' ,, 'maize'
627 line 9 for 'Ainsworth (C. G.)' ,, 'Ainsworth (G. C.)'
629 21 ,, 'Van der Plank (J. C.)' ,, 'Van der Plank (J. E.)'
637 16 ,, '*aroidea*' ,, '*aroideae*'
660 25 ,, 'they' ,, 'the pods'
676 45 ,, 'to' ,, 'by'
689 13 ,, 'Shear (J. M.)' ,, 'Shear (G. M.)'
720 46 delete '(Gilbert and Ellice)'
754 lines 28–29 for '*Botrytis cinerea*, and *Aplanobacter insidiosum* [ibid., xv, p. 586];' read 'and *Botrytis cinerea*; *Aplanobacter insidiosum* [ibid., xv, p. 586] and'
line 30 for 'occurs' read 'occur'
lines 35–37 delete '*A. insidiosum* . . . sainfoin'
776 line 31 for 'Cummins (C. B.)' read 'Cummins (G. B.)'
782 30 ,, 'isolated from' ,, 'found on'
813 31 ,, '*obtusispora*' ,, '*obtusisporum*'

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
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VOL. XVI JANUARY 1937

TAI (F. L.). **A list of fungi hitherto known from China.**—*Sci. Rep. Tsing-Hua Univ.*, Ser. B, ii, 2, pp. 137–167, 1936.

Among the items in this annotated list of 102 Chinese Phycomycetes (representing the first part of a complete list of all fungi recorded from China) are *Olpidium nematodeae* Skvortzow on a nematode in northern Manchuria (*Arch. Protistenk.*, lvii, p. 204, 1927) and *Synchytrium dolichi* on *Dolichos lablab* [*R.A.M.*, viii, p. 406]. The paper is preceded by an introductory note on noteworthy collectors of Chinese fungi [cf. ibid., xv, p. 683], together with a bibliography of the relevant literature comprising 175 titles.

SUBBA RAO (M. K.). **Report of the Mycologist.**—*Adm. Rep. Tea sci. Dep. Unit. Plant. Ass. S. India, 1935–36*, pp. 46–54, 1936.

During the period under review leaf disease of tea (*Cercosporella theae*) [*R.A.M.*, xiii, p. 216] was recorded for the first time in southern India from the High Range but its precise status is not yet known. No differences were observed between the author's strain of *C. theae* and one obtained from Ceylon. Spraying, regarded as impracticable on a large scale, is tentatively recommended to prevent the spread of the disease, while affected leaves and twigs should be burnt.

Tea leaves affected with sooty mould showed, in most instances, the presence of a *Capnodium*. Pink disease (*Corticium salmonicolor*) was commonly present and brown blight [*Glomerella cingulata*: ibid., xv, p. 748] frequently affected nursery tea seedlings. Velvet blight, probably caused by *Septobasidium theae* [ibid., x, p. 557], occurred on one estate, and a suspected case of canker (*Macrophoma theicola*) [ibid., xiii, p. 541] on another. Violet root rot (*Sphaerostilbe repens*) [ibid., xv, p. 748] was observed for the first time in southern India.

Soil applications of sulphur against witches' broom of tea [ibid., xiii, p. 541] have not given entirely satisfactory results, and the treatment requires further consideration. Tea seedlings grown in water culture solutions without sulphur developed brown and flaccid roots and tip-burn of the leaves, which withered and finally dropped off, in contrast with the normal growth in the plus sulphur series.

A die-back of dadap [*Erythrina lithosperma*] was associated with a *Fusarium* [ibid., x, p. 80]. *Grevillea* [*robusta*] was attacked by red root rot [*Poria hypolateritia*: ibid., xv, p. 747], which also affected tea bushes growing in the vicinity. Tung oil trees (*Aleurites* spp.) showed

a leaf disease due to a *Pestalozzia*, and one tree was affected by pink disease [*C. salmonicolor*].

GULYÁS (A.). **A magyar Dohányok virus-betegségei.** [On the virus diseases of Hungarian Tobacco.]—*Rep. Hung. agric. Exp. Sta.*, xxxix, 1–3, pp. 1–34, 9 pl., 1936. [German and French summaries.]

Certain varieties of tobacco commonly grown in Hungary, e.g., 'Debrečen' and 'Szulok', are said to be very susceptible to virus diseases, of which the following types are amongst the most prevalent in the country. 'Mosaïque marmorée' [marbled mosaic] is characterized by the development on the leaves of yellowish-green or yellow spots, but is not very dangerous, since a dry and warm climate, like that of Hungary, is unfavourable to it. Ring spot [*R.A.M.*, xv, p. 831] is widespread; three different forms are recognized, two of which cause considerable damage in certain areas, especially in the neighbourhood of Debrečen; the third is of a rarer occurrence and only affects Havana tobacco. Veinbanding [loc. cit.] of Hungarian tobacco completely destroys the leaves but only occurs on soils with a high nitrogen content. Vein necrosis [cf. ibid., ix, p. 626] is dangerous because it kills the plant, but only occurs rarely. 'Debrečen' tobacco is frequently attacked by a disease known under a name equivalent to 'vein whiteness'; this disease has often been confused with damage caused by *Thrips* spp., but has now been shown to be due to a virus. Yellow mosaic [ibid., xv, p. 614] is frequent on 'Szulok' tobacco in the Transdanubian provinces. Spot necrosis [loc. cit.] is occasionally found in association with vein necrosis, but only on the main stem of the tobacco plant.

[HOPKINS (J. C. F.).] **Mycological notes. Epidemic wildfire and angular spot in Tobacco.**—*Rhod. agric. J.*, xxxiii, 7, pp. 479–481, 1936.

In discussing Clayton's recent work on the relation between epidemic outbreaks of tobacco wildfire (*Bacterium tabacum*) and water-soaking of the leaves [*R.A.M.*, xv, pp. 537, 687], the author states that in Rhodesia leaves are frequently turned over by high winds so that the under surface is exposed to rain, and often show large water-soaked areas after thunderstorms. Furthermore, low topping and high-nitrogen fertilizing factors found by Clayton to facilitate water-soaking, are not uncommon in Rhodesia. Wildfire is regarded as a potential menace to the local industry, held in check only by the frequent dry spells occurring during the growing season.

It has been observed in a number of cases in the Colony that similar conditions obtain with regard to angular leaf spot [*Bact. angulatum*: ibid., xv, p. 613], though the differences between the symptoms of the epidemic and the 'static' phases are less pronounced than with wildfire.

KALASHNIKOFF (K. J.). Закономерности развития **Cladosporium fulvum Cooke.** [The bio-ecology of *Cladosporium fulvum* Cooke.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 70–71, 1936.

The results of a series of experiments conducted since the very recent discovery of tomato leaf mould (*Cladosporium fulvum*)

[*R.A.M.*, xv, p. 690] in the U.S.S.R. have shown that the optimum temperatures for spore germination and growth of the fungus are 20° to 26° C., and for host infection 24° to 25°. Preliminary results indicated that in the initial stages the development of the disease may be retarded by underground irrigation of the tomato beds in glass-houses, the yield in which was more than doubled by this measure, as compared with that in houses watered from above [cf. ibid., ix, p. 349].

HEIM (R.). **Les champignons destructeurs des charpentes d'habitation.** [Fungi destructive of constructional timber.]—*Rev. Mycologie*, N.S., i, 3, *Suppl.* pp. 8–11, 4 figs., 1936.

In this preliminary paper the author divides the fungal rots of constructional timber first into four classes, viz. fibrous, lamellated, fragmented or parallelepipedal, and alveolar or nodular, exemplified, respectively, by the rots caused by *Phellinus* [*Fomes*] *cryptarum* [see next abstract]; *Poria* [*Trametes*] *sinuosa* [*R.A.M.*, viii, p. 3] and *Gloeocystidium insidiosum* Bourd. & Galz.; *Merulius lacrymans* and *Trametes vaporaria* [ibid., iv, p. 250]; and *Stereum frustulosum* [ibid., xii, pp. 669, 795] and *Xanthochrous* [*Trametes* or *Fomes*] *pini* [ibid., xv, p. 694]. He then further classifies them as blue (caused especially by *Ceratostomella*), green (*Chlorosplenium aeruginosum*), red (exotic Polypores, notably *Porogramme*), yellow (*Merulius* spp.) and black (*Armillaria mellea*) rots. In attempting to identify a timber rot the condition must first be placed in one of each of these two classes, identification of the causal organism by the fruit body, hyphae, rhizomorphs, and xylostroma being the next step. In Europe the chief timber-rotting fungi number about 14, viz. *M. lacrymans*, which causes four-fifths of the damage to constructional timber in France, *Coniophora cerebella* [*C. puteana*: ibid., xv, p. 622 *et passim*] found chiefly in cellars, *F. cryptarum* common mostly in dark, badly ventilated places, *T. vaporaria* and *T. persoonii*, both of which require high humidity, *Poria medulla-panis* [ibid., ix, p. 78], which produces a rapid rot of piles and processed timber, and *P. megalopora*, a serious agent of destruction in well-aerated, damp situations, on shutters, bridges, &c., *S. frustulosum*, which causes a slow, interior, outwardly invisible rot of oak beams, *Lenzites abietina* [ibid., xiv, p. 412] and *L. sepiaria* [ibid., xv, pp. 332, 761] which chiefly attack pine and spruce posts in mines, *Paxillus panuoides* [ibid., xv, p. 186], found in mines, cellars, and ice-houses, and *Schizophyllum commune* [ibid., xiv, p. 270], common but not very serious on mine posts. In addition, *Stereum purpureum* [ibid., xv, p. 676] occurs on beech in sawmills, and *Ungulina annosa* [*Fomes annosus*] on standing pine trees.

CARTWRIGHT (K. ST. G.) & FINDLAY (W. P. K.). **The principal rots of English Oak.**—v+38 pp., 13 pl., 2 figs., London, H.M. Stationery Office, 1936. Price 2*s*.

A brief description is given of the gross and cultural characters, economic importance, and control of the principal fungal rots of standing and felled oak [*R.A.M.*, xii, p. 795] in England. Experiments made to ascertain the relative resistance to fungal attack of oak sapwood and heartwood showed the average loss of weight of the former after 8

months to be 39·3 per cent. and of the latter 6·8 per cent. The rots of standing oak dealt with include brown cubical rot (*Polyporus sulphureus*) [ibid., xiv, p. 795], brown oak (*Fistulina hepatica*) [ibid., xiv, p. 663], white butt rot (*P. dryadeus*) [ibid., xiii, p. 664], piped rot (*Stereum gausapatum* Fr.) [ibid., xiv, p. 810], 'partridge wood' (*S. frustulosum*) [see preceding abstract] and the minor rots, *Ganoderma applanatum* and *G. resinaceum*. 'Partridge wood' first shows as a dark brown discoloration, in the midst of which variously sized, irregularly distributed white patches appear, in which the elements of the wood disintegrate, leaving spindle-shaped holes. These holes are lined with white mycelium; they gradually enlarge but never coalesce, remaining separated by thin sheets of dark, firm wood.

The rots of felled oak discussed include *Daedalea quercina* [ibid., xiii, p. 137], white sap rot (*S. hirsutum*) [ibid., xiii, p. 334], *Bulgaria polymorpha* [ibid., xi, p. 612], *Irpex obliquus*, *Polystictus versicolor* [ibid., xv, p. 621], *Polyporus adustus* [ibid., xi, p. 684; xii, p. 343], *Lentinus tigrinus* [ibid., xv, p. 471], and *Fomes ferruginosus*; an account is also given of dry rot (*Merulius lacrymans*) and the serious decay caused in the oak timbers of buildings by the fungus provisionally named *Phellinus cryptarum* Karst. [ibid., xiv, p. 136; xv, pp. 186, 622], a fungus in no way related to that known as *F. cryptarum* Bull. by German authors nor to that recorded by Rea (British Basidiomycetae, 1922) as *Polyporus cryptarum* (Bull.) Fr. which appears to be closely related to *P. benzoinus*; Bourdot is stated to consider it identical with *Poria megalopora* [see preceding abstract], though the fructification is definitely of the *Fomes* type.

The work concludes with notes on chemical stain of oak wood caused by the action of iron on the tannin, golden oak (*Eidamia catenulata*) [ibid., iii, p. 489], yellow stain caused by a fungus of the *Penicillium divaricatum* [*Paecilomyces varioti*] group [ibid., xiv, p. 663], and grey stain (*Ceratostomella quercus*) [ibid., xiv, p. 274].

DELÉCLUSE (R.). **Quelques champignons ennemis du Chêne-liège au Maroc.** [Some fungal enemies of the Cork Oak in Morocco.]—*Rev. Path. vég.*, xxiii, 3, pp. 244–257, 4 figs., 1936.

Brief, popular notes are given on 37 fungal species found on cork oaks [*Quercus suber*] in Morocco, including *Auricularia mesenterica* (a prevalent and dangerous parasite); *Vuilleminia* [*Corticium*] *comedens* [*R.A.M.*, iii, pp. 72, 438], causing important losses in stacked timber; *Stereum gausapatum* [see preceding abstract], which may cause appreciable damage; *S. hirsutum*, which is very common, and causes a very active rot; *S. spadiceum* Pers. [ibid., xiv, p. 810], *Coriolus* [*Polystictus*] *pergamenus* [ibid., xv, p. 410], *C.* [*P.*] *versicolor*, *Ungulina fomentaria* [*Fomes fomentarius*: ibid., xv, p. 330] (rare in Morocco), *Xanthocrous* [*P.*] *cuticularis*, *Armillariella* [*Armillaria*] *mellea*, and *Schizophyllum commune*.

ARMSTRONG (F. H.). **The mechanical properties of 'black heart' Ash wood (Fraxinus excelsior, L.).**—*Quart. J. For.*, xxx, 3, pp. 202–210, 6 graphs, 1936.

The discoloration of the heartwood of English ash (*Fraxinus ex-

celsior) known as 'black heart' varies from light to very dark brown, and is generally present in the butt log, extending in many cases for a considerable distance up the tree. The author points out that the origin and cause of the condition are doubtful, and describes a series of tests made to determine the effect of the discoloration on the mechanical properties of the timber. The results obtained [which are expressed graphically and fully discussed] showed that the discoloured wood is not inferior to normal ash in bending or compressive strength, hardness, or toughness and no differences in the types of fracture for normal and black heart ash were observed.

FERRARIS (T.). **Seccume primaverile dei germogli di Pioppo canadese.** [Spring wilt of the shoots of Canadian Poplar.]—*Riv. agric., Roma*, xxxii, 736, p. 223, 1936.

A detailed description is given of the epidemic occurrence of leaf fall (*Venturia tremulae*) [*R.A.M.*, xv, pp. 328, 618] of Canadian poplars [*Populus canadensis*] in Italy in the spring of 1935.

Control measures recommended consist in spraying young trees and nursery stock with 1 per cent. cupric mixtures, in plant sanitation, and in the use of the immune hybrid 'Arnaldo Mussolini' and the resistant *P. carolinensis* and *P. virginiana*.

FRESA (R.). **Argentine Republic: Melampsora larici-populina in the Delta of Paraná.**—*Int. Bull. Pl. Prot.*, x, 7, pp. 145–146, 1936.

Poplar rust (*Melampsora larici-populina*) [*R.A.M.*, xv, p. 618] is reported to have developed with great intensity on *Populus nigra* var. *italica* in the Delta of Paraná, this being the first record of its occurrence in the Argentine. The degree of infection was observed to vary with local environmental conditions; in severe cases complete defoliation of the trees resulted from the attacks of the rust, commonly associated with which were *Septoria populi* [ibid., xiv, p. 15], *Cercospora populina*, *Sphaceloma populi*, and a *Dothichiza* resembling *D. populea* [ibid., xv, p. 471], all in a serious form, while a *Phyllosticta* was also found on the leaves.

GOIDÀNICH (G.). **Le alterazioni cromatiche parassitarie del legname in Italia. III. Colorazione rosa del legno di Pioppo causata da 'Fusarium javanicum' Kds.** [Parasitic staining of timber in Italy. III. A red discoloration of Poplar wood caused by *Fusarium javanicum* Kds.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 1, pp. 65–68, 1 fig., 1936.

In 1935 the author isolated *Fusarium javanicum* [*R.A.M.*, v, p. 125] (stated to be the first record of this fungus in Europe) from the trunk of a *Populus canadensis* tree growing near Rome. The fungus caused a violaceous-red or lilac discoloration of varying intensity, most conspicuous near the periphery of the trunk, and gradually shading off into the healthy parts. Hyphae were noted in the cells of the parenchyma and medullary rays and inside the vessels. The anatomical structure of the discoloured tissues remained unaffected and the infection did not appear to cause serious damage.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. VII.**—*Pap. Mich. Acad. Sci.*, xxi, pp. 243–267, 10 pl., 1936.

In this further paper, describing his studies of twelve resupinate Polypores of the Great Lakes [*R.A.M.*, xiv, p. 805] the author states that *Poria xantha* [ibid., viii, p. 3] (reported by Blair to attack mill roofs: *Phytopathology*, ix, p. 54, 1919; x, p. 61, 1920) was found to be common on conifers in the north-western forests, occurring frequently on charred logs and stumps.

P. ambigua was observed to be common throughout hardwood forests and especially on land liable to flooding. The species has been reported from California [under the name of *P. vaporaria*: see Fawcett: Citrus diseases, p. 149: *R.A.M.*, xv, p. 574] as a secondary pathogen of citrus roots, breaking down and rotting the bark and wood of the roots killed by waterlogging or injured by other organisms. It is pointed out that *P. vaporaria* Fr. sensu Burt is totally distinct from the true *P. vaporaria* as interpreted in Sweden and by the present author.

Trametes heteromorpha is found abundantly in the forests of north-western America and also occurs on railway sleepers and other structural timbers, frequently causing serious damage.

ROBAK (H.). **Notes on Norwegian wood rots. I. Notes on Stereum sanguinolentum A. & S. and red heart rot in living conifers. II. The genus Coniophora DC. and the 'vaporarius' rot in conifers.**—Reprinted from *Nyt Mag. Vidensk.*, lxxvi, 4 pp., 1936.

From a sample of *Picea excelsa* showing a characteristic reddish-brown rot of the heart wood, the writer in 1934 isolated in pure culture a mycelium with all the typical features of *Stereum sanguinolentum* [*R.A.M.*, xiv, p. 803], of which this is believed to be the first record for Norway.

A brown, cubical butt rot of pine and spruce in northern Europe has commonly been attributed, in the absence of fruit bodies, to *Polyporus vaporarius* [*Poria vaporaria*] or *Polyporus borealis* [loc. cit. and ibid., xv, p. 411], but the fungus isolated from a rot of this type on spruce appears, from the mode of branching of the brownish-grey to blackish mycelium and the verticillate arrangement of the clamp-connexions, to be a species of *Coniophora*. The rôle of a *Coniophora* infecting balsam firs [*Abies balsamea*] in association with *P. balsameus* [ibid., viii, p. 412] in Canada was held by Clara W. Fritz (*Proc. roy. Soc. Can.*, Sect. v, 1923) to be secondary, and such may also be the case in Norway, although in the writer's opinion this is improbable.

ROBAK (H.). **Studies in the biology of wood-destroying Hymenomycetes. I. Contribution to the knowledge of homothally and heterothally in some species of Thelephoraceae and Polyporaceae. II. The ability of haploid mycelia to produce rot.**—Reprinted from *Nyt Mag. Vidensk.*, lxxvi, 15 pp., 3 diags., 1936.

Monospore mycelia of seven species of Thelephoraceae and Polyporaceae (obtained from sporophores in the vicinity of Oslo, Norway,

unless otherwise stated) were cultured singly and in combination. Fully developed clamp-connexions were regularly produced by *Stereum sanguinolentum* [see preceding abstract] from pine (*Pinus sylvestris*) and spruce (*Picea excelsa*) (Oslo) and from the latter host in western Norway, and by *S. rugosum* [*R.A.M.*, xiii, p. 810] from alder (*Alnus glutinosa*), and these two species may therefore be regarded as homothallic. The remaining species, viz., *Corticium evolvens* [ibid., iv, p. 453] from stored spruce logs, *S. purpureum* from spruce timber and living Norway maple (*Acer platanoides*), *Lenzites sepiaria* [see above, p. 3], *Polystictus abietinus* [ibid., xii, p. 343], and *Trametes serialis*, all from spruce (the last-named originating near Stockholm, Sweden), did not form clamp-connexions. In cultures representing every possible combination of mycelia from a single sporophore, *L. sepiaria* and *T. serialis* followed, with certain irregularities, the scheme of bipolar sexual differentiation, while *S. purpureum*, *P. abietinus*, and probably *C. evolvens* pursued the tetrapolar course.

Monospore mycelia of *C. evolvens*, *S. purpureum*, *P. abietinus*, and *T. serialis* were found to develop very satisfactorily on spruce and pine blocks, and in the case of the two last-named decay was quite as extensive in the samples inoculated with monospore cultures as in those treated with polyspore material. *T. serialis* in particular was responsible for a considerable loss of weight in the inoculated wood. Neither *C. evolvens* nor *S. purpureum* induced any perceptible symptoms of rot during the six months covered by the tests.

HIRT (R. R.). **The progress of blister rust in northern White Pine.**—*J. For.*, xxxiv, 5, pp. 506–511, 1 graph, 1936.

The results of investigations from 1928 to 1935 at Warrensburg, New York, indicated that though only a comparatively small percentage of aecidiospores of *Cronartium ribicola* is produced by blister rust-infected white pines (*Pinus strobus*) [*R.A.M.*, xv, p. 412] in newly established plantings, such production continues for a number of years after attack and may serve to intensify the activity of the rust in the presence of *Ribes*. In this connexion the writer insists on the need for systematic inspections and re-eradication of the alternate hosts of *C. ribicola* in and near young white pine plantings in regions of known blister rust infestation. Some diseased individuals may survive an attack of rust, but such trees are generally so badly damaged that they cannot be expected to yield commercially valuable timber. The fungus has been observed to persist for at least eight years in newly established plantings exposed to rust infection at the outset but subsequently protected from further invasion. Each year some of the diseased trees die, so that eventually the planting should be free of the rust if an efficient system of exclusion is maintained.

Twenty-fifth Annual Report of the Conservation Department, State of New York, for the year 1935. Legislative Document (1936) No. 38.—500 pp., 76 figs., 1 diag., 3 graphs, 2 maps, 1936.

This report contains a number of references to the white pine blister rust [*Cronartium ribicola*: see preceding abstract] control campaign and other items of phytopathological interest in connexion with New

York silviculture. Figures are given indicating the scope of the work in various fields: e.g., on State Reforestation areas, 23,069 acres protected, 949,177 *Ribes* destroyed; on private land, 242,259 and 4,711,621, respectively. A re-examination was made during the year of a series of 'damage study' plots established from 1923 to 1928 in four counties. In one such plot, consisting of 25- to 30-year-old white pines, there are still 230 healthy trees notwithstanding 43 per cent. mortality from blister rust. No doubt the *R. nigrum* eradication in 1928 contributed largely to this favourable result, but in any case the extent of the injury caused by the disease under natural conditions is extremely variable and dependent on a number of silvicultural factors.

One of the two organisms associated with resinosis of white and red pines [*Pinus strobus* and *P. resinosa*] is *Polyporus schweinitzii* [*R.A.M.*, xiv, p. 803]. There are some indications that the spread of infection is gradually declining in the most severely diseased plantations in the Rochester district, but not before some 50 to 65 per cent. of the trees have been destroyed. Predisposition to resinosis appears to be definitely connected with the heavy, somewhat alkaline soils in the area under observation and does not assert itself until the trees are over ten years old. Scots pine [*P. sylvestris*] seems to be immune from the disease and its extended cultivation in the affected area is therefore recommended.

All the epidemic infections (up to 75 per cent.) of red pines by *Tympanis pinastri* [ibid., xiv, p. 612] occurred in plantings over 18 years old. The fungus enters the trees through branches that have been 'shaded out' during the closing in of the plantation. Most of the plantings examined had a density of over 1,200 trees per acre and had been neither thinned nor pruned. Infection was most severe on the more alkaline soil types.

Quick (C. R.). **Chemical control of harmful fungi during stratification and germination of seeds of Ribes roezli.**—*Phytopathology*, xxvi, 7, pp. 694–697, 1936.

Full details are given of a series of tests on the control of [unspecified] damping-off fungi in the propagating medium (consisting of equal parts of river sand, fine forest loam, and sphagnum moss) used for the stratification and germination of *Ribes roezli* seeds in connexion with an investigation on the chemical eradication of *Ribes*. Good protection to seeds and seedlings was afforded by finely powdered cupric oxalate at the rate of 6 to 10 gm. per sq. ft. of soil surface. Satisfactory results were also given by basic cupric carbonate (4 to 8 gm. per sq. ft.), which was, however, slightly less efficacious than the foregoing. A number of other seeds, including other *Ribes*, snapdragon [*Antirrhinum majus*], and *Petunia*, have also been successfully treated by these compounds. Fairly good control was further given by 70 per cent. nitric acid (1 to 250) and 40 per cent. formaldehyde (1 to 750), but these methods of treatment were not quite so reliable as the dusts.

Burbidge (Nancy T.). **Root development in Pinus pinaster and the seasonal variation of its mycorrhizae.**—*Aust. For. J.*, i, 1, pp. 33–40, 1 diag., 1 graph, 1936.

The root systems of *Pinus pinaster* at the Western Australian Forest

Department's plantation at Applecross were excavated at the seedling stage and again after the first, second, and third years in the field. Mycorrhiza were present on all parts of the root system [*R.A.M.*, xiv, p. 410] in nursery plants, on the laterals and sublaterals in those of the first year, on the ends of the laterals and on the sublaterals after the second year, and on the sublaterals only after the third. They must therefore be ephemeral structures, rarely persisting for more than one season. The growth activities of both roots and mycorrhiza were found to be closely correlated with an abundance of moisture in the soil.

ROHDE (T.). **Eine neue Krankheit der Sitkafichte in Deutschland.** [A new disease of the Sitka Spruce in Germany.]—*Z. PflKrankh.*, xlvi, 6, pp. 277–284, 8 figs., 1936.

The writer describes the results of his recent investigations on a hitherto unreported disease of the Sitka spruce [*Picea sitchensis*] in the Lower Rhine and Hanover. On the stem the disturbance assumes the form of irregular dead ('bald') patches, measuring 2 by less than 1 cm. and upwards, and conspicuous only on the young wood where needles are normally plentiful. In severe cases the cortex exudes white resin through longitudinal fissures revealing the dry surface of the xylem, while the stem may be girdled and the whole upper portion killed. The small lateral branches are more or less extensively desiccated and devoid of needles, and the diseased portions of the cortex and cambium are brown and discoloured. The outermost layer of the lesions was uniformly constituted by the wood formed in 1934, so that the die-back must have preceded the incremental growth of 1935. The examination of a ten-year-old planting, with Sitka spruces predominating, showed that only 70 to 80 per cent. of the stand was entirely free from injury, the extent of which on the diseased trees ranged from slight damage on the branches to the death of the upper half of up to $\frac{1}{6}$ of the total number of stems.

The apothecia of a Discomycete, to be described by Prof. Kirschstein in a forthcoming number of *Ann. mycol., Berl.*, as *Pezizula rohdeana* n. sp., were found in abundance on the cortical lesions, but the part played by the fungus in the etiology of the disease—which is definitely of a parasitic character—remains to be investigated. The external symptoms are reminiscent of those associated with *Phoma*, *Phomopsis*, and *Nectria cucurbitula* [*R.A.M.*, vi, p. 683], but in no case could the fruit bodies of these organisms be detected.

BUNCE (S. C.). **The preservation of fencing materials.**—*J. S.-E. agric. Coll., Wye*, xxxviii, pp. 150–152, 5 pl., 1 fig., 1936.

In tests on the preservation of fencing timber with creosote the quickest and best results were obtained by boiling for a period of 6 to 8 hours and then allowing the wood to cool in the creosote for 12 to 24 hours. Complete impregnation resulted from boiling for 12 hours, followed by cooling in the creosote. The cost of creosoting a 6 by 6 in. gate-post to a distance of 3 ft. from the base amounted to approximately one shilling, and the length of life was increased by 50 to 100 per cent.

CHIPP (W. F.). **The utilization of the open tank process for the preservative treatment of sleepers in Malaya.**—*Malay. Forester*, vi, 3, pp. 95–99, 3 figs., 1 diag., 1936.

Full technical and economic details are given of the working of an open-tank plant, subsidized by the Government of Johore, for the impregnation of railway sleepers of *Koompassia malaccensis* wood with a mixture of creosote and Diesel oils in equal parts [*R.A.M.*, xiv, p. 484].

FEDORINTSCHIK (N. S.). Основные закономерности биологии Капустной килы (**Plasmodiophora brassicae Wor.**). [Life-history of club root of Cabbage (*Plasmodiophora brassicae* Wor.).]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 69–70, 1936.

Recent investigations by the author have shown that the zoospore of *Plasmodiophora brassicae* [*R.A.M.*, xi, p. 16; xiv, p. 206; xv, p. 624] after entering a root hair of a cruciferous host immediately becomes a myxamoeba which, after repeated division of the nuclei, is transformed into a plasmodium containing up to 100 nuclei and over [cf. ibid., x, p. 3]; the plasmodium very soon breaks up into small uninuclear masses, each of which develops a wall and undergoes reduction division, resulting in the production of a large number of zoosporangia with four or eight zoospores each. The zoospores from the mature zoosporangia (inside the root hair) migrate into the tissues of the roots, where they are transformed into myxamoebae which multiply by budding; when the cell contents are exhausted the myxamoebae begin to fuse together and after this transitional and probably sexual phase form plasmodia. The plasmodium immediately undergoes reduction division and then breaks up into uninuclear portions which are gradually transformed into spores. The subsequent invasion of the root tissues is effected by division of the host cells but not by active migration of the parasite. The development of club root tumours is due to the intense multiplication of the myxamoebae by budding.

KAUFMANN (O.). **Eine gefährliche Viruskrankheit an Rübsen, Raps und Kohlrüben.** [A dangerous virus disease of Rape, Colza, and Kohlrabi.]—*Arb. biol. Reichsanst. Land- u. Forstw., Berl.-Dahl.*, xxi, 4, pp. 605–623, 10 figs., 1936.

After reviewing the recent literature on the virus diseases of cruciferous plants, the author describes a disease of this type on winter-sown rape (*Brassica rapa oleifera*) [cf. *R.A.M.*, xv, p. 731], first observed in April, 1935, in Schleswig-Holstein, the main symptoms of which are an axial turning-over and curliness of the younger leaves, premature death of the older leaves and of whole plants before the end of the vegetative period, and severe chlorosis; mosaic patterns are not always present. Plants that have overwintered in the field may be very severely stunted, with a considerably thickened collar, and their leaves may show vein-clearing. In less severely diseased plants, the shoots are smaller, curved or geniculate, and frequently knotted. The diseased plants in the field most frequently occur in small nests of 3 or 4, but

also of as many as 30 plants. In large fields the edges and corners are usually more extensively infected than the middle portions. The disease was also found on rutabaga (*B. napobrassica*) and more rarely and in a lighter form on colza (*B. napus oleifera*). On these hosts, the leaves were not turned over, the most outstanding symptoms being a mosaic pattern and a heavy savoying of the foliage, which was further severely deformed and occasionally entirely killed by necrotic spots and tearing-up of the margins.

The virus was easily transmitted to healthy rape, colza, and rutabaga by sap inoculation and through the insect *Lygus pratensis* both in the greenhouse and in the field. While so far the disease has only caused significant losses to rutabaga, its easy transmission in the field renders it potentially very harmful.

ROLAND (G.). **Étude de la jaunisse de la Betterave.** [A study on Beet yellowing.]—*Rev. Path. vég.*, xxiii, 3, pp. 184–207, 6 figs., 1 graph, 1936.

This account of the author's detailed studies on virus yellows (yellowing) of beets is a shorter version of a series of papers already noticed from another source [*R.A.M.*, xv, p. 548].

Crown rot in Sugar-Beet.—*J. Dep. Agric. Irish Free St.*, xxxiv, 1, pp. 131–132, 1936.

In further experiments carried out in the Irish Free State on the control of heart rot of sugar beet [*R.A.M.*, xv, pp. 415, 764], at each of 25 centres three plots were given 14, 21, and 28 lb. per acre, respectively, of commercial granulated borax, a fourth plot being left untreated; the applications were made when the seed was sown or shortly after, and in no case after 21st June. To determine the effect of applying boron compounds to already affected crops, at each of 19 centres where the disease had already appeared one plot was dressed with borax at the rate of 28 lb. per acre between 16th July and 21st August, a further plot at 13 of these centres being dressed at the same time with an equivalent amount of borocalcite.

No heart rot developed at five centres, but even here borax applications in increasing quantities (up to 28 lb. per acre) produced corresponding increases in yield. Taking all the plots together where borax was applied at about sowing time the average yield per acre for the plots given dressings of 14, 21, and 28 lb. borax per acre were, respectively, 11 tons 6 cwt., 11 tons 16 cwt., and 12 tons 3 cwt., as compared with 8 tons 3 cwt. in the untreated controls, the corresponding figures for sugar-content being 18·2, 18·3, 18·3, and 17·1 per cent. The average yield for the plots given the late applications of borax and borocalcite was, respectively, 10 tons 2 cwt. and 9 tons 8 cwt., as compared with 6 tons 16 cwt. in the untreated controls, the corresponding figures for sugar-content being 17·3, 17·3, and 15·9 per cent.

ZAUMEYER (W. J.) & KEARNS (C. W.). **The relation of aphids to the transmission of Bean mosaic.**—*Phytopathology*, xxvi, 7, pp. 614–629, 1936.

This is an amplified, tabulated account of field and greenhouse

studies on the aphid transmission of bean (*Phaseolus vulgaris*) mosaic [*R.A.M.*, xv, p. 766], a preliminary note on which by the first-named writer has already appeared [ibid., xii, p. 414]. The following aphids, in addition to those previously recorded, were found capable of conveying the disease from infected to healthy plants: *Aphis medicaginis* from *Amaranthus retroflexus* and *P. lunatus*, *A. spiraecola* from *Spiraea vanhouttei*, and *Rhopalosiphum pseudobrassicae* from turnip, producing, respectively, 44, 87, and 100 per cent. mosaic. The infection percentages for the other aphids used ranged from 52 for *Illinoia* [*Macrosiphum*] *pisi* from peas to 93 for *Hyalopterus atriplicis* from *Chenopodium album*.

SASAKI (M.). **On the anthracnose of Adzuki Bean in Hokkaido.**—*Rep. Hokkaido agric. Exp. Sta.* 36, pp. 53–77, 1936. [Japanese, with English summary on pp. *3–4*.]

A species of *Colletotrichum* identical in morphology with *C. phaseolorum* Takimoto [*R.A.M.*, xiv, p. 342] has been isolated from circular, reddish-brown spots on adzuki bean (*Phaseolus radiatus* var. *aurea*) [*P. angularis*] leaves in various localities of Hokkaido. Inoculation experiments with the pathogen on a number of legumes were unsuccessful except in the case of its own host and kidney beans [*P. vulgaris*], which reacted feebly by the development of a pale yellowish foliar discoloration. Good growth was made on onion, apricot, soy, rice-malt, asparagin, and Czapek's agars at a hydrogen-ion range between P_H 6·06 and 8·03. The minimum, optimum, and maximum temperatures for the development of the *Colletotrichum* were found to be 4° to 5°, 28°, and 37° C., respectively. Control measures should be based on improved cultural methods, seed treatment for 30 minutes with 0·1 per cent. mercuric chloride or 35 per cent. formaldehyde (1 in 240) and two to three applications, at fortnightly intervals, of 2–2–50 or $2\frac{1}{2}$–$2\frac{1}{2}$–50 Bordeaux mixture.

KHESWALLA (K. F.). **A Phoma disease of Asparagus.**—*Indian J. agric. Sci.*, vi, 3, pp. 800–802, 1 col. pl., 1936.

Asparagus plants at Pusa were observed in 1935 to be attacked by a disease characterized by a brown discoloration and shrivelling of the stems. The central tissues of the lesions turn ashy-white and later bear dark-coloured pycnidia, which rupture the epidermis, causing longitudinal cracks. The growth of the lateral branches is frequently arrested. All parts of the plants except the berries are liable to infection. In advanced cases the needles turn yellow, and partial or complete desiccation ensues.

Pure cultures of the fungus were obtained on Quaker oats agar and inoculated into wounded and unwounded stems with positive results. Mycelial growth was profuse on Quaker oats but pycnidia failed to mature; the latter were formed, however, on sterilized fragments of asparagus stems and produced numerous hyaline, oblong to fusiform, unicellular pycnospores, measuring 5·1 to 10·2 by 1·7 to 3·4 μ and thus agreeing with Bubak's description (*Bull. Herb. Boiss.*, vi, Sér. 2, p. 408, 1906) of the A spores of *Phomopsis asparagi*. The absence of B spores precludes the identification of the Indian fungus as a *Phomo-*

psis and it is consequently referred to *Phoma asparagi* [*R.A.M.*, xii, p. 395].

BROWN (J. G.) & BUTLER (K. D.). **Sclerotiniose of Lettuce in Arizona.**—*Tech. Bull. Ariz. agric. Exp. Sta.* 63, pp. 475–506, 10 figs., 5 graphs, 1936.

Head lettuce, a major source of commercial gain in Arizona, is liable to severe infection by sclerotiniose, 'drop', or 'watery soft rot' (*Sclerotinia sclerotiorum*) [*R.A.M.*, xv, p. 167], first recorded in the State in 1925. The symptoms of the disease and life-history of the fungus are described in semi-popular terms, a list of its hosts (over 100) is given, the environmental conditions favouring infection are discussed, and control measures recommended. The ascospores of *S. sclerotiorum* appear to be capable of travelling several miles in a viable condition in Arizona and the sclerotia are disseminated on diseased plant material, in soil adhering to implements and the feet of men and animals, and especially in irrigation and flood water.

At the lower elevations in the southern part of the State infection is possible only during the late autumn, winter, and early spring, when the night temperature ranges from 32° to 50° F., but by means of its sclerotia the fungus survives the summer and may remain alive in dry soils for eleven years. Under damp conditions, however, these bodies may rot extensively in the soil, and experiments with tap water indicate that large numbers can be killed by flooding infected fields for over 18 days.

The disease may be combated by strict attention to field sanitation, deep ploughing, crop rotation with immune plants (e.g. maize), roguing of diseased lettuces, and soil disinfection; in connexion with the last-named laboratory experiments gave promising results in the case of sulphuric acid and funginox (a commercial preparation of mercuric chloride in hydrochloric acid). A 1 per cent. solution of the former destroyed the sclerotia in 30 hours, while the latter was effective in 24 at a dilution of 1 in 1,000. For field treatments it would be necessary to use a 2 per cent. solution of sulphuric acid, so that the estimated cost of $80 per acre (exclusive of labour) would probably be too high except on small plots or for drenching the soil after roguing; funginox is recommended for similar purposes.

JOËSSEL (P. H.). **Essais de traitements contre les maladies du Melon. (Année 1935.)** [Experimental treatments against Melon diseases. (Year 1935.)]—*Ann. Épiphyt.*, N.S., ii, 1, pp. 21–30, 3 graphs, 1936.

In further spraying experiments against melon diseases carried out at Avignon [*R.A.M.*, xv, p. 628] only powdery mildew [*Erysiphe cichoracearum*] developed but the results again confirmed the efficacy of Bordeaux mixture against this disease. The best result was given by the Bordeaux mixture with lime-sulphur (1 kg. copper sulphate, 1 kg. caseinated lime, 2 l. lime-sulphur 32° Baumé per 100 l.), which in addition to its great fungicidal value also markedly stimulated growth. Lime-sulphur alone was both fungicidal and stimulating. Potassium permanganate was ineffective, oxyquinoline [ibid., xiii, p. 690] rather

better, and malachite green [ibid., xiv, p. 765] and phosphine sulphate (each 0·1 kg. with 0·5 l. amyl alcohol per 100 l.) better still. Copper sulphide proved less satisfactory than had been expected. The alternate use of Bordeaux mixture and lime-sulphur gave a slightly better result than either alone. Powder A (containing 60 per cent. sulphur and 2 per cent. copper acetate) was definitely fungicidal, and gave better results when used with Bordeaux mixture than when used alone; used with lime-sulphur it slightly increased yield. Powder B (containing 10 per cent. copper sulphate) appeared to give some control of mildew.

Wilson (J. J.). **The pathological relationship between the host and parasite in varieties and strains of Watermelons resistant to Fusarium niveum E. F. S.**—*Res. Bull. Ia agric. Exp. Sta.* 195, pp. 107–152, 7 figs., 5 graphs, 1936.

A detailed account is given of the author's histological studies of the infection of the watermelon by *Fusarium* [*bulbigenum* var.] *niveum* [*R.A.M.*, xv, p. 553] in Iowa, the results of which showed that watermelon plants are susceptible at all stages of their growth to invasion by the fungus through the root tips [ibid., xiv, p. 144] and ruptures formed by newly developed lateral roots. Under conditions favourable for the parasite, the xylem vessels in the primary root of both resistant and susceptible varieties were rapidly invaded at, or shortly after, germination of the seed by the mycelium, resulting in a high percentage of wilting. While variations in environmental conditions retarded or accelerated wilting for periods from one to several days, there was a general upward trend in the percentage average daily wilt which reached a maximum at 23 to 39 days after planting susceptible seedlings and at 16 to 24 days with resistant seedlings; with the latter, this maximum was followed by an abrupt drop of the daily wilt down to less than 1 per cent. in plants 40 to 45 days old. While older susceptible plants, repeatedly infected through young lateral roots, apparently died from internal pathological disturbances involving the accumulation of gum-like substances, tyloses, and mycelium in the xylem vessels, older resistant plants appeared to develop a defensive mechanism which allowed them to withstand the attacks of the parasite. A significant feature was that in fields heavily infected with *F. bulbigenum* var. *niveum*, the surviving plants showed gum-like substances occluding the vessels surrounding the older xylem near the centre of the root axis, while the secondary xylem at the periphery of the stele remained unaffected; wilted susceptible plants, on the other hand, were filled with gum-like matter throughout the primary root system.

In studies of the inheritance of varietal resistance, Pride of Muscatine, Iowa King, and more particularly Iowa Belle were shown to be suitable for transmission of resistance, and backcrossing the F_1 hybrid (resistant × susceptible variety) to the resistant parent has proved the most effective method of building up resistance. It is pointed out, however, that in exceptionally heavily infected soil Iowa King selections failed to show measurable differences in resistance as compared with susceptible controls.

ARK (P. A.) & TOMPKINS (C. M.). **Bacteriosis of Pumpkin fruits in California.**—*Science*, N.S., lxxxiv, 2166, p. 18, 1936.

In September, 1935, young pumpkins of the Early White Bush Scallop, Yellow (or Golden) Summer Crookneck, Zucchine, and Danish varieties near San Pablo, California, were severely attacked by a bacterial soft rot, which was apparently favoured by warm, moist weather and rapidly disseminated by insects, especially *Diabrotica* sp. In one field the losses were found to range from 60 to 75 per cent. Only immature fruits were infected.

The causal organism is stated to differ from the related *Erwinia carotovora* [*Bacillus carotovorus*] in its host range, comprising 22 horticultural varieties of pumpkin, carrot, and celery (both natural hosts), and 10 other plants, as well as in its morphological and physiological characters. A striking feature of the pumpkin organism is the pale pink coloration which it develops on eosin-methylene blue agar slants.

CHAZE (J.) & SARAZIN (A.). **Nouvelles données biologiques et expérimentales sur la môle, maladie du Champignon de couche.** [New biological and experimental data on the 'môle' disease of the edible Mushroom.]—Reprinted from *Ann. Sci. nat.*, *Bot.*, Sér. 10, xviii, 84 pp., 3 pl., 8 figs., 1 graph, 1936.

In this full, detailed account of their investigations into the morphological, cytological, and immunological aspects of the môle disease (*Mycogone perniciosa*) of mushrooms (*Psalliota*) [*campestris*] (with which is associated, in a secondary capacity, a species of *Verticillium*), [already noticed in part from other sources: *R.A.M.*, xiv, pp. 554, 674, 739], the authors state that *P. campestris* possesses a natural immunity from infection, due not to phagocytosis, but to the humoral secretion of an antibody [ibid., xv, p. 700]. In pure culture, the vegetative hyphae of *P. campestris* prevent the germination of the spores of *M. perniciosa*, or the development of the hyphae, and also produce profound modifications in the sporulation of both fungi associated with the disease. The mycelium of *P. campestris* invades the cultures of both parasites without becoming affected, and culture media on which it had grown prevented the germination of the spores of the latter, the antibodies secreted by *P. campestris* becoming diffused in the media. The parasitism of *M. perniciosa* on the mushroom may, therefore, be considered as a reversible phenomenon. In pure culture, the immunity of *P. campestris* is complete; in the beds, resistance is only partial. This loss of resistance is difficult to explain but may possibly be attributed to the destruction of vegetative hyphae by bacteria or to the transformation and neutralization of the antibodies as a result of bacterial action. The formation of antibodies by *P. campestris* is the first example of humoral secretion recorded among fungi. Experiments on the control of the disease are in progress.

PASSECKER (F.). **Ein neuer Unkrautpilz auf Champignonbeeten (Pleurotus passeckerianus Pilát).** [A new weed fungus in Mushroom beds (*Pleurotus passeckerianus* Pilát).]—*Z. PflKrankh.*, xlvi, 6, pp. 271–277, 1 fig., 1936.

The enemies of the cultivated mushroom (*Agaricus* [*Psalliota*]

campestris) include, in addition to actual parasites, a number of so-called 'weed' fungi, which deprive the host of its nutrient medium, restrict its natural extension, and possibly emit noxious metabolic products. The writer has recently investigated in Vienna, in collaboration with A. Pilát, a new species of *Pleurotus*, believed to have been commonly confused in the past with *P. mutilus* [*R.A.M.*, xi, p. 493], which is to be described in a forthcoming publication by C. Kawina and A. Pilát entitled 'Atlas des Champignons de l'Europe' (Prague) as *P. passeckerianus*. The new fungus differs from *P. mutilus* in the very friable texture of the cap, the extremely tenuous or absent stalk, the creamy-yellow to faintly pink lamellae, the floury smell and taste, and the much richer fat-content of the white to very pale pink spores (9 to 11 by 4 to 5 μ), basidia, and other organs.

Details are given of parallel tests in which *P. passeckerianus* (germinated on a gelatine medium) and the cultivated mushroom were grown on horse dung in the same vessel at 10° to 14° and 18° to 19° C., the latter completely overrunning the former at the lower temperature, whereas at the higher the position was reversed.

Precautionary measures against the introduction and spread of the 'weed' fungus should include the use of 'pure culture spawn', careful preparation of the medium, timely planting at a relatively low temperature, and disinfection of the beds with 2·5 per cent. lysol [loc. cit.].

GOLDING (F. D.). **Bemisia nigeriensis Corb., a vector of Cassava mosaic in Southern Nigeria.**—*Trop. Agriculture, Trin.*, xiii, 7, pp. 182–186, 1936.

In further work in Southern Nigeria on the transmission of cassava mosaic by *Bemisia nigeriensis* [*R.A.M.*, xv, pp. 72, 701] 606 and 400 adult individuals collected from mosaic cassava in the field were placed in two cages containing four and two healthy cassava plants, respectively, and all six plants developed the disease. When 26 and 64 adults were introduced into two lamp chimneys each containing one healthy plant, both plants became diseased 27 days later. In three experiments in which large numbers of the insects were placed on cassava plants in cages on different dates the maximum intervals between the introduction of *B. nigeriensis* and the first appearance of mosaic were 13, 19, and 21 days, respectively. Observations made on 19 cassava varieties over 34 weeks showed that those which were resistant to mosaic were more lightly infested by the insects than were the susceptible varieties. But when 1,802 adult individuals of *B. nigeriensis* were placed in a cage containing 4 mosaic and 2 healthy plants of each of 5 resistant varieties, the latter did not develop mosaic and the apparent immunity shown by certain varieties is therefore attributed to inherent resistance rather than to any repellent effect upon the insect vector.

The seven most resistant cassava varieties studied had purple petioles, while of the ten most susceptible varieties five had green, and five purple or purplish petioles. Attempts to transmit mosaic from cassava to *Manihot glaziovii* and *Euphorbia heterophylla* were unsuccessful but on two occasions *M. glaziovii* was observed to show symptoms resembling cassava mosaic.

Loucks (K. W.). **Spraying experiments for the control of certain Grape diseases.**—*Bull. Fla agric. Exp. Sta.* 294, 16 pp., 1 fig., 1936.

In vine-spraying tests carried out from 1932 to 1934 in Florida, where the principal diseases of the berries are black rot (*Guignardia bidwellii*) [*R.A.M.*, xiv, pp. 10, 557], bitter rot (*Melanconium fuligineum*) [ibid., vi, pp. 11, 460], and ripe rot (*Glomerella cingulata*) [ibid., x, pp. 358, 359], Bordeaux mixture gave the best control of all rots, especially when applied during blossoming and fruit setting. Bitter rot and ripe rot were more difficult to control than black rot. Owing to the residue left by Bordeaux mixture, a stainless spray should be used as the fruits approach the ripening stage.

As a result of the experiments the following spray schedule is recommended: (1) delayed dormant, copper sulphate 4 lb. in 50 galls. water, with sticker; followed by Bordeaux 4–4–50 plus insecticide (2) 7 to 10 days after the buds burst (or when the shoots are 8 to 18 in. long), (3) at bloom opening, (4) after the bloom has opened, (5) after fruit set, and (6) when the fruit is half grown; by copper acetate 2 lb. in 50 galls. water, with 2 oz. gelatine and insecticide (7) when the fruit is nearly full size and (8) full size (without gelatine); and by Bordeaux mixture 4–4–50 with sticker, and, if necessary, insecticide (9) as soon as the fruit is gathered.

Moreau (L.) & Vinet (E.). **Sur la vigueur de la Vigne dans ses rapports avec le sol, la fumure, et quelques maladies de la grappe.** [On the vigour of the Vine in its relations with soil, manuring, and some diseases of the bunches.]—*Ann. agron., Paris*, vi, 4, pp. 542–558, 2 graphs, 1936.

In studies on the effect of soil type and fertilizers on vine vigour and the relation of such vigour to the development of disease the authors found that in the part of the experimental vineyard where the vine grew well naturally (bottom of the hill) and where the addition of fertilizers had little effect (under 16 per cent. increased vigour), coulure [non-setting of the flowers: *R.A.M.*, x, p. 640] was not conspicuous, but where growth was not naturally vigorous (top of the hill) the addition of balanced fertilizer increased the disease. Grey rot of the fruit [*Plasmopara viticola*] and *Oidium* [*Uncinula necator*] were favoured by increased growth, whether due to soil type or fertilizer, but whereas the former disease was constantly related to vine vigour, without regard to the part of the vineyard concerned, the latter was affected by local conditions.

Fertilizer lacking in potassium only increased vigour (and then slightly) in that part of the vineyard where vegetation was naturally weakest. It reduced coulure, grey rot, *P. viticola*, and mildew, and was the only fertilizer tested that had an adverse effect on the two fungi.

The authors conclude that factors increasing the growth rate or prolonging the growth period also increase susceptibility to disease of organs in active growth, and other things being equal, the progress of growth of the vine is regarded as the best indication of disease susceptibility and resistance.

BRANAS (J.) & BERNON (G.). **Recherches sur le traitement de la panachure.** [Studies on the control of variegation.]—*Rev. Vitic., Paris*, lxxxv, 2193, pp. 26–27, 1936.

The authors state that the condition of the vine known in France as 'panachure' [variegation] is a partial yellowing of the leaves, not amenable to control by spraying with iron compounds. It only occurs on vines that are definitely affected with 'court-noué' [*R.A.M.*, xv, p. 631], or on stocks that seem likely to develop this disease. Preliminary experimental results appear to indicate that this condition may be remedied by carefully spraying the affected foliage with an 8 to 10 per cent. suspension of lamp-black in water with 0·3 per cent. gelatine. The treatment evidently causes an increase in the temperature of the leaves sprayed and may result in scorching of the thin-leaved varieties, such as Aramon, for which reason the spray should be applied in the early hours of the morning.

Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für die Jahre 1931/1934. [Report of the Federal Experimental Institute for Fruit Growing, Viticulture, and Horticulture, Wädenswil, for the years 1931 to 1934.]—*Landw. Jb. Schweiz*, l, 6, pp. 569–666, 3 figs., 1936.

Among the numerous items of phytopathological interest in this report not already summarized from other sources, the following may be mentioned. In 1931 and 1933 a bud rot of apples, associated with the pink mycelium of a *Fusarium* [? *lateritium*: cf. *R.A.M.*, vi, p. 734] and with bacteria, was prevalent in various parts of Switzerland. The contents turned brown and the buds and brachyblasts died and fell. Severely affected varieties included Boskoop, Bohn, and Gravenstein, in which 16 to 97 per cent. of the buds were killed.

The most active agent of decay among apples stored at temperatures 4°, 2·5°, 0°, and −1° C. in 1929–30 and 1930–1 was *Gloeosporium album* [ibid., xiv, p. 771] which attacked 67·9 per cent. of the fruit in the former and 85·1 per cent. in the latter year, followed by *F. putrefaciens* [*F. avenaceum*: ibid., xiii, p. 35]. In general, the tendency to storage rot increases parallel with the age of the fruit and does not become prominent until February; the incidence of infection declines with falling temperature, although 365 out of 1,376 were attacked at 0°, mostly by *G. album*. Storage rot does not affect all varieties equally, Jakob Lebel, Boskoop, and Gravenstein being among the most susceptible, while Glocken [Bell], Berne Rose, Croncels Transparent, Canada and Ontario Pippins, and Minister Hammerstein are very resistant. Both in 1932–3 and 1933–4 the introduction of ozone into the cold storage chamber largely prevented the fungal decay of apples and cherries held at 0° [cf. ibid., xv, p. 722].

Dormant applications of 5 per cent. carbolineum retarded the development of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xv, pp. 506, 653] and maintained the bushes in a vigorous state throughout the summer. Both 1·5 per cent. Bordeaux mixture and 1 per cent. fungan (Schenk, Wollishofen) [ibid., xii, p. 450] gave satisfactory control of dahlia leaf spot (*Entyloma*) [*dahliae*: see below, p. 63] in 1931, when spraying was carried out on 1st and 16th July.

Săvulescu (T.), Sandu-Ville (C.), Aronescu (A[lice]), & Alexandri (V.). **L'état phytosanitaire en Roumanie en 1934–1935.** [Phytosanitary conditions in Rumania in 1934–1935.]—*Publ. Inst. Cerc. Agron. României*, 25, 97 pp., 23 figs., 2 maps, 1936. [Rumanian, with French translation.]

In October 1934, favoured by a warm, wet autumn a severe outbreak of *Puccinia triticina* occurred on young wheat throughout Rumania [cf. *R.A.M.*, xv, p. 201], but the infection did not cause important losses. Against bunt (*Tilletia foetens* and *T. tritici* [*T. caries*]) the best seed disinfectants were formalin, germisan, uspulun, urania, higosan [ibid., xiv, p. 499], and ceresan, which gave, respectively, 99·5, 99·5, 99·5, 99·4, and 98·1 per cent. clean ears. Maize was widely affected by rust (*P. maydis*) the degrees of infection shown by 14 different lines of the Regele Ferdinand variety ranging from 0 to 5. *Ustilago zeae* was present on maize in all parts, 10 lines of Regele Ferdinand maize showing from 5 to 71 per cent. infection, and four of Pignoletto Todireşti 8 to 20 per cent.

Soy-beans suffered important losses in many districts from three forms of virus disease, leaf curl, brown mosaic, and yellow mosaic [ibid., xv, p. 202]. The first, which was the least common, was characterized by dwarfing of the plants and crimping of the leaves, which were asymmetrical, irregularly shaped, bore protuberances on the upper surface, and had rolled-in edges; mosaic symptoms were sometimes present as well. The second appeared as brown, angular spots along the veins, or brown spots irregularly scattered over the surface. The third, and most prevalent, form consisted in a yellow discoloration along the veins, the leaves having a marbled appearance. General chlorosis was sometimes present; vegetation was retarded. From all three forms the only organism isolated was the yellow mosaic virus, inoculations with which into healthy soy-beans reproduced symptoms of disease, the incubation period ranging from 6 to 13 days. The virus was inactivated by exposure to a temperature of 80° C., and by the addition of 96 per cent. alcohol (30 parts to 70 parts of juice). It was weakly pathogenic to beans, but produced no symptoms on groundnut or tomato.

Luffa in experimental plots was affected by a mosaic which in one plot caused a 20 per cent. loss of yield. The leaves became discoloured along the veins, marbled, and dried up, the fruits of severely infected plants failing to develop and becoming mummified. A virus was obtained from diseased material, inoculations with which reproduced the condition.

Sorghum near Bucarest showed symptoms resembling those attributed by Burrill in 1877 to *Bacillus sorghi*. Reddish-purple spots appeared on the inner surface of the sheaths of the lower leaves, and later on the lamina, whence they spread irregularly towards the top of the plant. From infected material a Gram-negative bacterium with an optimum growth temperature of 30° to 31° was isolated. Inoculation experiments indicated that it might be the causal organism, but that it was dependent on aphids for introducing it to the host and effecting its spread.

Chilli pepper [*Capsicum annuum*] was again attacked by *Actinomyces*

totschidlowskii Serb. [ibid., xv, p. 261], the losses reaching 50 per cent. of the crop in one locality.

In one nursery peonies were infected by *Cladosporium paeoniae* [ibid., viii, p. 293]. Leaf spot (*Heterosporium pruneti*) [ibid., vii, p. 581] was widespread on *Iris germanica*. Cherries suffered from leaf fall due to *Cercospora cerasella* [ibid., x, p. 774], pears were attacked by *Gymnosporangium sabinae* [ibid., xiii, pp. 316, 398], and walnuts, for the first time in Rumania, by *Alternaria nucis*, which principally affected the young fruits, though infection can occur at any time during growth. *Nectria applanata* was very common on walnuts in nurseries, especially on the 'noble' varieties.

[Walters (E. A.).] **Report on the Department of Agriculture, St. Lucia, 1935**—pp. 30–32, 1936.

During the year under review, 750,000 banana plants were inspected in St. Lucia, and 6,504 (or 0·86 per cent.) affected with Panama disease [*Fusarium oxysporum cubense*] destroyed [*R.A.M.*, xv, p. 2]. The Colony is divided for banana inspection purposes into nine main districts, each under an officer whose duty it is to organize inspection and the nursery supply of plants, and when possible to select and lay out new plantations. If more than 2 per cent. Panama disease is found in an area, special concerted measures are arranged, and, if practicable, the area is isolated.

Nattrass (R. M.). **Annual Report of the Mycologist for the year 1935.**—*Rep. Dir. Agric. Cyprus, 1935*, pp. 57–64, 1936.

During 1935 [cf. *R.A.M.*, xiv, p. 741], wheat in Cyprus was widely infected by *Septoria tritici* [ibid., xv, p. 775], much of the early withering of the outer leaves being due, apparently, to this fungus. Seed treatment of wheat with formalin and copper carbonate against bunt (*Tilletia caries* and *T. foetens*) in small-scale trials gave complete control as against 1·8 and 2·5 per cent. infection in two untreated control plots, and 0·9 and 0·2 per cent. in two plots treated with agrosan G. In many localities *S. passerinii* [ibid., xi, p. 745] caused a withering of the first-formed leaves of barley, while net blotch (*Helminthosporium teres*) [ibid., xv, p. 86] was present everywhere but unimportant. Young oats were attacked by *H. avenae* [ibid., xv, pp. 289, 456], which seldom infects mature plants.

The *Botrytis* causing chocolate spot of beans (*Vicia faba*) was found by Sardiña closely to resemble *B. fabae* [ibid., xiv, p. 734; xv, p. 698] but had rather larger sclerotia. Zonate leaf spot (*Cercospora zonata*) [ibid., xiv, p. 83] was common on beans grown under trees, often in association with chocolate spot.

In a potato field in Famagusta about 80 per cent. of the plants developed a shrivelling of the main stem with consequent collapse of the whole plant due to *Pythium butleri*. The fungus, not previously recorded in Cyprus on any economic crop, was a virulent parasite under the conditions obtaining and also affected *Festuca* in patches on a newly planted lawn. *Alternaria solani* was frequently present on tomatoes [ibid., xv, p. 406] growing in the vicinity of severely affected

potatoes. Celery was affected by a virus disease probably akin to yellows [cf. ibid., xv, p. 808] in one locality.

Clasterosporium carpophilum was recorded for the first time on leaves of stone fruits. *Puccinia pruni-spinosae* [ibid., xv, p. 704] caused severe apricot shot hole. *Sphaerotheca pannosa* and *Phyllactinia corylea* [ibid., xiv, p. 680] were locally severe on peach and almond, respectively, the former vigorously attacking the fruit. *Sphaeropsis malorum* Peck [*Physalospora obtusa*: ibid., xv, p. 774], not previously recorded on the fruit, was isolated from apples attached to the tree. Citrus was affected by the two physiological diseases mottle leaf [ibid., xv, p. 778] and 'lefka blemish' (identified by Reichert as 'dry, shallow nooksan'), the latter characterized at picking time by hard, brown, slightly sunken lesions up to 1 cm. in diameter, and usually not over 1 mm. deep.

Exobasidium unedosis was observed on *Arbutus unedo*, and the aecidial stage of *Puccinia graminis* on *Berberis cretica*, both for the first time.

Report of the Director for the year ending 31 October, 1935.—*Bull. Conn. agric. Exp. Sta.* 318, pp. 165–202, 1936.

Apart from information already noticed from other sources, this report contains the following items of interest. The potato variety 44–488 obtained from the United States Department of Agriculture, besides being resistant to blight (*Phytophthora infestans*), is also highly resistant to drought and tipburn [*R.A.M.*, xiii, p. 261]. Unsprayed plants produced 184 bushels per acre, as compared with only 85 bushels for unsprayed, certified Green Mountain potatoes in an adjoining plot.

Further investigations into a disease of peach trees, referred to as 'X disease', showed that it is probably due to a virus and is introduced into the orchard by a wild host. During one season control was effected in 50 to 100 per cent. of the cases by the removal of diseased branches. Healthy trees budded with diseased cuttings in 1934 showed a larger percentage of disease than those budded in 1933. The chokecherry [*Prunus virginiana*] appears to be a possible source of infection, as in those parts of Connecticut where the disease is present these trees show a mosaic-like condition of the leaves resembling X disease, and are also commonly associated with diseased peaches in the orchard. The prompt removal of all diseased material appears to be the best method of control at present.

Continued spraying tests with lead arsenate, lime, and oil as a combined fungicide and insecticide effectively controlled sooty blotch [*Gloeodes pomigena*: ibid., xiv, p. 452] and scab [*Venturia inaequalis*: ibid., xv, p. 728] on all apple varieties except McIntosh. In one orchard of Wealthy apples practically no cedar rust [*Gymnosporangium juniperi-virginianae*: see below, p. 75] occurred on trees kept covered with a spray of lime-sulphur with casein glue.

Dead blossom leaf-spot of tobacco was occasioned by *Alternaria tenuis*, *Botrytis cinerea*, and other fungi developing on fallen blossoms and spreading to the leaves and from leaf to leaf in the curing shed. Three types of pole rot of tobacco were differentiated, viz., freckle, web, and vein rots, the first of which is attributed to *A. tenuis*.

Hungerford (C. W.). **Plant pathology.**—*Rep. Idaho agric. Exp. Sta. 1935*, (*Bull.* 220), pp. 39–43, 2 figs., 1936.

A severe epidemic of curly top in the Twin Falls section in 1935 was responsible for heavy losses in Contract seed bean [*Phaseolus vulgaris*] crops [*R.A.M.*, xiv, p. 339] and for somewhat lighter ones among Great Northerns, of which the most resistant strain was University Selection No. 81, also resistant to mosaic [see above, p. 11]. A few white-seeded segregants from a Red Mexican–Great Northern cross made in 1929 and grown in 1935 at Buhl, Idaho, under a heavy beet leafhopper [*Eutettix tenella*] infestation, showed a high degree of resistance to curly top. The following disease percentages were recorded for the U I 59, 81, 88, and 123 strains and the Ellsworth and Common bean varieties: common mosaic, 0, 0, 0, 0, 0, and 85, respectively; yellow mosaic, 1, 2, 3, 2, 5, and undetermined; curly top (16th July), 12, 2, 26, 5, 13, and 9; the bushel yields per acre were, respectively, 38·3, 38·1, 5, 42·6, 30·3, and 22·5. In addition to the plants already reported as susceptible to curly top may be mentioned *Zinnia* and a number of ornamentals.

Pea mosaic [ibid., xv, p. 551] was severe in the McCall–Cascade green pod pea area on the Alderman, Dwarf Alderman, and Laxton's Progress varieties, causing up to 75 per cent. infection. A fairly high proportion of the red clover [*Trifolium pratense*] plants in the neighbourhood of the pea fields showed mosaic symptoms, and greenhouse tests demonstrated the identity of the virus on peas, red clover, and alsike [*T. hybridum*].

Copper carbonate was found to be the most effective treatment of wheat seed-grain against bunt [*Tilletia caries* and *T. foetens*], infection by which in 1935 was the heaviest on record since 1928, reaching 60 to 75 per cent. in the Malad Valley. None of the 14 varieties tested in the winter wheat nurseries showed absolute resistance to both 'tall' [*T. foetens*] and 'short' [*T. caries*] bunt but Relief is almost immune from the latter [ibid., xi, p. 502], (which was exceptionally prevalent during the period under review causing stunting of the plants), and resistant to many strains of the former, so that it may be recommended for the dry land wheat-growing section in the south-east of Idaho.

Barley plants attacked by stripe [yellow] rust [*Puccinia glumarum*] were much less resistant to low temperatures than healthy ones, those with 100 per cent. infection being killed at 21° F.

The perfect stage of *Phoma medicaginis* [ibid., xiii, p. 32], the causal organism of a widespread lucerne disease known as 'black stem', was found to be *Pleospora rehmiana*.

Cheo (C. C.). **A preliminary survey of plant diseases on cultivated plants in Hopei Province 1934–1935.**—*Chin. bot. Mag.*, iii, pp. 977–1011, 34 figs., 1936. [Chinese, with English summary.]

Notes are given on the economic importance and distribution on 63 cultivated plants in Hopei Province, China, of 151 diseases, among which may be mentioned a bacterial infection of wheat in Tinghsien closely resembling the yellow gum disease (*Aplanobacter agropyri* O'Gara); *Coniothyrium diplodiella* on grapes [*R.A.M.*, xv, p. 200]; and a prevalent leaf spot of apricots (*Guignardia* sp.) in the vicinity of Peiping [Peking].

ROGER (L.). **Notes de pathologie végétale. II.** [Notes on plant pathology. II.]—*Agron. colon.*, xxv, 223, pp. 15–23, 1936.

In these further notes on fungal diseases observed on material received from the French overseas possessions [*R.A.M.*, xv, p. 283] an account is given of a spotting of groundnut pods caused in Senegal by a *Rhizoctonia* [ibid., xiv, p. 212] producing chocolate-brown, round or irregular, isolated or confluent spots 2 to 10 mm. or more in diameter, sometimes covering half the surface of the pods but not penetrating the interior. The attack occurs late in the season and the development of the nuts is unaffected. In 1933–4 widespread infection of date palm leaves by *Graphiola phoenicis* [ibid., xii, p. 270] took place at Bamako. In the north of Dahomey cotton seed suffered from a pulverulent, carbonaceous rot caused by *Rhizopus arrhizus*.

Механизация борьбы с вредителями и болезнями сельскохозяйственных культур. [Mechanization of the control of agricultural pests and diseases.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr.*, *1935*, pp. 322–377, 10 diags., 7 graphs, 1936.

In this section of the report of the Institute of Plant Protection brief accounts are given of improvements which have been introduced in mechanical appliances used in the U.S.S.R. for the control of crop diseases. Of the six locally constructed seed-disinfecting machines tested by him, P. G. Davydoff states that Borghardt's KP-1 combined seed disinfector [*R.A.M.*, xv, p. 428] proved to be the best for extensive estates. Another combined cereal seed-grain disinfector (Popoff's P-2) is stated by V. G. Krasjko [Kraśko] to have a working capacity (dusting) of 6 to 10 tons per hour, and to be of satisfactory efficacy. J. A. Meissakhovitch briefly describes and figures a hand-driven machine for treating (by dipping) cotton seed with formalin, by means of which three men can handle up to 600 kg. seed per hour. Kraśko gives details of tests of two fruit-tree sprayers, constructed by the Vulcan works, each capable of either horse- or motor-traction, and having spraying capacities of from 2·5 to 5 hect. 3- to 5-year-old and 0·8 to 3 hect. 15- to 30-year-old fruit trees per hour.

VAUPEL (O.). **Mittel für Saatgutbeizung.** [Seed-grain disinfection preparations.]—*Dtsch. landw. Pr.*, lxiii, 34, p. 422, 1936.

Attention is drawn to certain alterations in the newly published list of cereal seed-grain disinfectants officially recognized by the German Plant Protection Service [see next abstract]. A slight reduction ($\frac{3}{4}$ l. per 100 kg.) has been made in the quantity of ceresan liquid required for the control of barley stripe [*Helminthosporium gramineum*] by the short disinfection process, but on the other hand the amount recommended for the treatment of rye seed-grain against snow mould [*Calonectria graminicola*] is increased from $2\frac{3}{4}$ to 3 l. Germisan is no longer applicable to the treatment of oats [against loose smut, *Ustilago avenae*] by the short disinfection process.

BECKER (K. E.). **Zur Herbstbeizung.** [On autumn disinfection.]—*Dtsch. landw. Pr.*, lxiii, 35, p. 438, 1936.

Following a brief introductory note on the paramount importance of cereal seed-grain disinfection in German agriculture, the writer tabulates, with explanatory comments, the preparations officially recognized (August, 1936) by the Plant Protection Service as effective against the principal seed-borne diseases [see preceding abstract]. The following alterations are made in the previous year's recommendations [*R.A.M.*, xv, p. 83]. Abavit nassbeize Schering controls wheat bunt [*Tilletia caries* and *T. foetens*] at a concentration of 0·1 per cent. (30 minutes' immersion). Weizenfusariol and roggenfusariol are withdrawn from the schedule. Germisan is efficacious against snow mould of rye [*Calonectria graminicola*] at 0·4 per cent. (sprinkling). This fungus is also controllable by ceresan nassbeize (U. 564) at a strength of 1·75 to 2 per cent., using the short disinfection process with 1·5 l. per 50 kg. The same preparation (2 per cent.) and method are recommended for the elimination of barley stripe [*Helminthosporium gramineum*], which is further amenable to treatment with fusariol dust 1454a (Chem. Fabrik Marktredwitz A.G.) at the rate of 100 gm. per 50 kg. Two new dusts, effective against loose smut of oats [*Ustilago avenae*] in addition to the diseases already mentioned, have been added to the list, viz., abavit-neu universal-trockenbeize (Schering-Kahlbaum A.G.) and akasan (Dr. A. Kossel, Marktredwitz).

BEHLEN (W.). **Wo stehen wir heute in der Beizfrage? Rückblick und Ausblick.** [Where do we stand to-day as regards the disinfection question? Retrospect and outlook.]—*Nachr. Schädl. Bekämpf., Leverkusen*, xi, 3, pp. 105–112, 5 figs., 1936. [English, French, and Spanish summaries on pp. 153, 156–157, 161.]

The progress made in Germany during the last ten years in the co-operative disinfection of cereal seed-grain is reviewed [*R.A.M.*, xiv, p. 380] and suggestions made for further efforts (by canvassing and demonstration) on the part of treating and cleaning establishments to interest small-holders in this valuable means of increasing their yields, not only of cereals, but also of beetroot, flax, hemp, peas, beans, and the like. It is estimated that some 20 to 40 per cent. of this class of farmers still remains to be convinced of the efficacy of the officially recognized methods of seed treatment.

Bericht über die Tätigkeit der Eidg. agrikulturchemischen Anstalt Liebefeld-Bern im Jahre 1935. [Report on the work of the Federal Agricultural-Chemical Institute, Liebefeld-Bern, during the year 1935.]—*Landw. Jb. Schweiz*, l, 6, pp. 545–568, 1936.

The following note occurs in this report. Attempts to combat the reclamation disease of cereals [*R.A.M.*, xv, p. 792] by the application of copper sulphate (over and above the ordinary complete fertilizer) to Huron wheat, Berna rye, and Goldregen oats at the rates of 0·1 to 0·5 gm. per pot containing 3·5 kg. of soil (corresponding to 30 to 150 kg. per hect.) were most successful in the case of the first-named crop. Rye showed no favourable response to the treatment and the yield of oats was somewhat increased only by the heaviest application.

GREANEY (F. J.). **Cereal rust losses in Western Canada.**—*Sci. Agric.*, xvi, 11, pp. 608–614, 1936. [French summary.]

The results of controlled experiments, estimated by the method described in a previous communication [*R.A.M.*, xv, pp. 429, 632], indicated that during the period 1925 to 1935, inclusive, stem [black] rust (*Puccinia graminis*) in Manitoba and Saskatchewan annually reduced the possible wheat crop by 10·8 per cent., equivalent to a loss of $30,784,000, and the oat crop (during 1929 to 1935 only) by 5·5 per cent. or $2,041,000. To this amount must also be added the loss due to deterioration in the quality of the grain, 87·3 per cent. of the carloads of wheat examined in the Western Grain Division in 1933, a rust-free year, being placed in the three top grades, as against 44·8 per cent. in 1935, a bad rust year. It is estimated that during the eleven years under review the annual loss from this source was $2,070,400 for wheat alone. At a conservative estimate the annual loss from cereal rusts in the three prairie provinces averages $40,000,000.

ATKINS (J. M.). **Ecological factors in north Texas related to the 1935 stem rust epidemic.**—*Plant Dis. Reptr, Suppl.* 93, pp. 31–41, 3 graphs, 1936. [Mimeographed.]

In the severe wheat stem rust (*Puccinia graminis tritici*) [*R.A.M.*, xv, p. 707) epidemic of 1935, no one factor of weather or condition of crop was responsible for the outbreak in Texas. Favourable temperatures for rust development [ibid., iii, p. 326], excessive precipitation and high humidity, thin stands, and late maturity of the crop all contributed their respective parts, and favourable winds served to carry the abundant inoculum produced over a long period to other States.

JOHNSTON (C. O.), MELCHERS (L. E.), LAUDE (H. H.), & PARKER (J. H.). **The stem rust epidemic of 1935 in Kansas.**—*Plant Dis. Reptr, Suppl.* 92, pp. 19–30, 1 graph, 2 maps, 1936. [Mimeographed.]

Factors in the wheat stem rust (*Puccinia graminis tritici*) epidemic in Kansas in 1935 were the heavy infection in northern Texas [see preceding abstract], prevailing southerly winds in May and June, heavy rain, high relative humidities, frequent dews, and favourable atmospheric temperatures (during the latter half of May and throughout June), late tillering and heading due to drought in early spring, a long fruiting period, and the susceptibility of the varieties grown.

RASHEVSKAYA (Mme V. F.) & BARMENKOFF (A. S.). Выявление расового состава бурой листовой ржавчины Пшеницы **Puccinia triticina.** [Determination of the physiological races of the Wheat brown leaf rust *Puccinia triticina.*]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 485–487, 1936.

The results of studies on wheat brown rust (*Puccinia triticina*) material collected from twenty places distributed over the U.S.S.R. [except East Siberia and the Russian Far East] showed the existence there of 13 physiological races of the rust, namely, forms 9, 10, 13, 17, 19, 20, 53, 64, 65, 66, 67, 68, and 69 [*R.A.M.*, xv, p. 707]. Of these forms 65 and 20 were the most widely distributed geographically and occurred

most frequently. The fact that form 66 reacted identically on all the differential varieties used [loc. cit.], while form 64 gave the same reaction on five and an indeterminate reaction on three of the varieties, is considered to indicate the inadequacy of the present range of varieties for distinguishing between certain of the physiological forms of *P. triticina.*

KARGOPOLOVA (Mme N. N.). Фенольные соединения Пшениц в связи с устойчивостью их к **Puccinia triticina.** [Phenolic compounds in Wheats in relationship to their resistance to *Puccinia triticina.*]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 491–492, 1936.

In this brief summary the author states that it was experimentally shown that the cell sap of wheat varieties immune from (e.g., *Triticum timopheevi* and *T. monococcum*), or highly resistant to, brown rust (*Puccinia triticina*) is characterized by a high content of protocatechuic phenols, while that of susceptible varieties is poor in or entirely devoid of these compounds [cf. *R.A.M.*, xv, p. 674], both at the germination of the seed and at the waxy maturity stages. Another interesting correlation was the constant prevalence of pyrocatechuic phenols in immune or resistant varieties and of pyrogallic phenols in the susceptible. In special tests, the pyrocatechuic phenols were shown to be highly toxic to the *P. triticina* spores, while the pyrogallic phenols were but weakly toxic.

RYZHKOVA [RYJKOVA] (Mme Z. F.). Влияние зараженности различных с.-х. машин на заспорение зерна спорами твердой головни. [Significance of the contamination of various agricultural machines in the infection of seed-grain with spores of bunt.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 147–149, 1936.

The author gives a few details of tests which showed that harvesting, threshing, and winnowing machines accumulate and serve to spread the spores of wheat bunt [*Tilletia caries* and *T. foetens*] even in regions where the disease is comparatively rare. Strict disinfection of the machines is advocated before moving them from one area to the next.

KVASHNINA (Mme E. S.) & ETMISHEVA (Mme Z. S.). Изучение фунгисидных свойств сульфидов (сероводород, сернистый шлак) и разработка способа их применения для обеззараживания семян. [Studies on the fungicidal properties of sulphides (hydrogen sulphide, sulphurous slag) and elaboration of methods for their use in seed disinfection.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 416–419, 1936.

The results of field experiments in 1935 in different localities of the Azoff-Black Sea region confirmed the efficacy of hydrogen sulphide [*R.A.M.*, xv, p. 670] in the control of wheat bunt [*Tilletia caries* and *T. foetens*], barley covered smut [*Ustilago hordei*], loose smuts of millet [*Panicum miliaceum*], wheat, barley, and oats [*U. panici-miliacei*; ibid., xv, pp. 786, 787; *U. tritici, U. nuda*, and *U. avenae*]. Exposure of sufficiently dry seed-grain to atmospheres containing 400 gr. (liquid) hydrogen sulphide per cu. m. for 72 hours did not adversely affect either

the germinability of the seed or the yield of the ensuing crops. With damp seed-grain, the germinability of which was reduced by hydrogen sulphide, almost equally good control without undue injury to germinability and with comparatively slight reduction of stands was obtained by mixing the seed with granulated blast-furnace slag at the rate of 4 to 5 kg. per cu. m. of the enclosed space.

NEMIRITZKY (B. G.), POLYAKOFF (I. M.), & LOBIK (V. I.). Новые протравители. [New seed disinfectants.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 461–464, 1936.

In laboratory tests a dust consisting of clay with 10 per cent. naphthenic acid was as effective in controlling wheat bunt (*Tilletia tritici*) [*T. caries*] as copper or iron naphthenates adsorbed on clay or talc, indicating that the toxic principle in the preparations is naphthenic acid. Treatment of wheat grain with the dust, at the rate of 1 gm. per kg. increased the percentage germination from 94 to 98, and also improved the germinative energy. The naphthenic acids are further stated to be highly toxic to parasitic fungi of the genera *Ascochyta, Alternaria*, and *Colletotrichum*, and their use for the disinfection of flax seeds is being actively studied since they exert no gelatinizing action on the seed; acidol [*R.A.M.*, xv, p. 785] (the technical product of naphthenic acids) adsorbed on clay has also shown good promise as disinfectant for flax seed.

SPANGENBERG (G. E.) & GUTNER (L. S.). Изучение расового состава твердой головни Пшеницы (**Tilletia levis Kühn** и **Tilletia tritici Wint.**) в полевых условиях. [Investigation in the field of the physiological races constituting Wheat bunt (*Tilletia levis* Kühn and *T. tritici* Wint.).]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp 489–491, 1936.

Studies carried out in 1935 in the region of Leningrad of wheat bunt material collected from different areas of the U.S.S.R. showed the existence there of a number of distinct physiological forms of the organisms, differing in their morphological details and also in their reactions on four differential wheat varieties [*R.A.M.*, xv, p. 287]. Morphologically the authors distinguish five forms of *Tilletia tritici* [*T. caries*], namely, dark brown, light brown, typical, whitish-brown, and spiculate, and three of *T. levis* [*T. foetens*], namely, dark brown, light brown, and greyish-brown; a fourth form, considered to be a new variety, for which the name *T. levis* var. *arenaria* Spangb. is suggested [without a Latin diagnosis], was found to be widespread in Uzbekistan and Kazakstan [central Asia]; it differs from the other forms of *T. foetens* in its sandy-brown colour, and in the smaller dimensions of its spores (average 18·1 by 15·2 μ as against 19·3 by 16·1 μ).

MARTIN (J. F.). **Reaction of Wheat varieties to composites of races of bunt occurring in the Pacific North-west.**—*J. Amer. Soc. Agron.*, xxviii, 8, pp. 672–682, 1936.

Of 250 wheat varieties tested in 1934 at Pendleton, Oregon, for their reaction to a local and a Pacific Northwest composite of bunt, the former consisting almost exclusively of *T. tritici* [*T. caries*] and the

latter containing both this organism and *T. levis* [*T. foetens*: *R.A.M.*, xv, p. 633], the soft red winter Hussar×Hohenheimer selection (C.I. 10068–1) was the most resistant, contracting only 0·9 and 0·3 per cent. infection, respectively, from the local and Northwest forms. Among the hard red winter types Oro, Yogo, Ashkof, and Ridit were the most resistant, responding by 1·3, 4·5, 5·3, and 4·5 per cent. infection, respectively, to inoculation with the local composite, the corresponding figures for the Northwest being 0·4, 3, 7, and 18·9, respectively. Several other varieties, e.g., Minturki, were highly resistant to the local composite but not to the Northwest (2·1 and 61·3 per cent., respectively). The most resistant of the commercial hard red spring varieties to the local composite were Garnet and Ruby (67·8 and 38·7 per cent. infection, respectively), while in the soft red winter (commercial) group the best results were obtained with Odessa (25·1). None of the commercial whites showed outstanding resistance, Quality, White Odessa, and Axminster being the least susceptible (33, 49·8, and 55·5 per cent. infection, respectively). Among the Clubs Albit and Hymar were the only commercial varieties showing any promise in this particular (21·1 and 43·1 per cent. local bunt, respectively). Golden Ball and Marouani were the most resistant of the durums (local 12·4 and 55·2, Northwest 29·3 and 47·7 per cent., respectively). Alaska (poulard) and White Polish were highly susceptible and Vernal (emmer) slightly resistant; the amphidiploid wheat×rye, on the other hand, was very resistant to both local and northwest composites (1 and 1·8 per cent. infection, respectively), but the transfer of this character to an agronomically desirable wheat type is attended by numerous complications.

Most of the late tillers produced in response to warm spring temperatures by the durum wheats were bunted, even where the heads on the early-formed tillers were healthy. The tendency for late tillers to contract bunt was also observed in other semi-resistant varieties.

SCHNELLHARDT (O.) & HEALD (F. D.). **The spore load of market Wheat.** —*Trans. Amer. micr. Soc.*, lv, 3, pp. 281–285, 2 figs., 1936.

Twenty-four samples of market wheat of the 1933 crop, secured from two organizations and a number of warehouses in Washington, were washed in distilled water in a specially constructed aspirator test-tube, and their load of spores (generally excluding those of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetens*]) determined by plating out unit volumes of the wash water from each sample on 2 per cent. dextrose potato agar in quadruplicate plates and counting the number of colonies developing.

Fungi belonging to eight genera were isolated, viz., *Alternaria*, *Aspergillus*, *Cladosporium*, *Dematium*, *Fusarium*, *Mucor*, *Penicillium*, and *Stemphylium*, *Cladosporium* and *Penicillium* being of most frequent occurrence [cf. *R.A.M.*, xiii, p. 363]. *C. malorum* [ibid., xi, p. 310] was detected in 20 out of the 24 samples examined, constituting 8·3 to 100 per cent. of the total fungal population (70 per cent. in 14). One sample of Federation yielded a spore load of 2,771 per grain, all *Penicillium*. A sample of Baart, besides harbouring 65,250 bunt spores per grain, determined by the Levy cell method, bore a load of 29 spores including *Cladosporium*, *Aspergillus*, and *Penicillium*.

PETCH (T.). **Gibberella saubinetii (Mont.) Sacc.**—*Ann. mycol., Berl.*, xxxiv, 3, pp. 256–260, 1936.

The author shows that the fungus causing scab on cereals widely known as *Gibberella saubinetii* (Mont.) Sacc. is not the species originally described by Montagne as *Gibbera saubinetii* in Syll. Crypt., p. 252, 1856, a specimen of which is preserved in Herb. Kew. Montagne's fungus had already been described in 1848 by Desmazières as *Sphaeria cyanogena* (= *Gibberella cyanogena* (Desm.) Sacc.) on decaying cabbage stalks and is now known to occur as a saprophyte on various herbaceous stems and also on elm, elder [*Sambucus niger*], and broom [*Cytisus scoparius*]. Apparently Saccardo first assigned the name *G. saubinetii* to the fungus on cereals but Shear and Stevens have pointed out [*R.A.M.*, xv, p. 118] that the latter is the same species as that named by Schweinitz *Sphaeria zeae*. Accordingly the fungus causing scab of cereals must be known as *G. zeae* (Schw.) Petch.

BLIN (H.). **À propos du piétin du Blé. L'action du soufre et du superphosphate.** [On foot rot of Wheat. The action of sulphur and of superphosphate.]—*J. Agric. prat., Paris*, N.S., c, 31, pp. 94–95, 1936.

After an allusion to the beneficial effects of sulphur on foot rot of wheat [*Cercosporella herpotrichoides* and *Ophiobolus graminis*: *R.A.M.*, xv, p. 782], the writer cites examples of the deleterious action of superphosphate (notwithstanding recent evidence to the contrary [ibid., xv, p. 288]) on the course of the disease.

OORT (A. J. P.). **De oogvlekkenziekte van de granen, veroorzaakt door Cercosporella herpotrichoides Fron.** [The eye spot disease of cereals caused by *Cercosporella herpotrichoides* Fron.]—*Tijdschr. PlZiekt.*, xlii, 7, pp. 179–210; 8, pp. 211–234, 5 pl., 1 fig., 1 graph, 1 map, 1936. [English summary.]

Wheat and barley are stated to be liable to severe damage in Holland from the attacks of *Cercosporella herpotrichoides* [*R.A.M.*, xv, pp. 709, 783], formerly attributed to *Ophiobolus herpotrichus* and confused with *O. graminis* [ibid., x, p. 446]. The disease, locally known as 'eye spot' from the characteristic elliptical, dark-bordered lesions extending up the leaf sheaths from soil-level, is particularly severe on clay and sandy clay soils in maritime districts and along river banks.

The above-mentioned eye spots appear in November or December on wheat sown in September or October, and by the following spring several tillers may have been killed. The lesions on the surface of the leaf sheaths bear small, black mycelial patches. In the later stages the typical features of eye spot are apt to become obscured and the general appearance of the plants resembles that produced by *O. graminis*. Secondary fungi associated with *C. herpotrichoides* include species of *Fusarium*, *Pencillium*, *Cladosporium*, *Pestalozzia*, and miscellaneous organisms of no economic importance. Lodging develops from early June onwards and is accompanied by a basal cracking of the haulms, producing large, brown lesions on rye and sometimes also on wheat in sandy soils.

Cercosporella herpotrichoides was readily isolated from wheat, barley, rye, *Alopecurus myosuroides* [*A. agrestis*], *Poa pratensis*, and *Apera spica-venti* and inoculated with positive results into wheat, barley, oats, rye, and a number of grasses. Under field conditions, however, oats are very highly resistant and rye virtually immune. Winter wheat is much the most susceptible crop, followed by winter barley. Various strains of the fungus were differentiated on the basis of mycelial coloration and other cultural characters. *C. herpotrichoides* is a relatively slow-growing fungus with an optimum temperature at 20° to 23° C., minimum —5°, and maximum above 28°. Spore formation occurred on thin layers of potato stem or malt agar, the process being apparently favoured by alternating low (—3°, 0°, and 3°) and moderate (10°) temperatures.

The results of inoculation tests with strains Sp (? from wheat: sent by R. Sprague, U.S.A.) [ibid., xiv, p. 230]; C (Zealand), E (Groningen), F (France), and H 1 (Guelderland), all from wheat, showed marked differences in virulence to the individual hosts, strain Sp infecting wheat but not grasses or oats, C infecting oats and grasses but only causing negligible attack on wheat, while E, F, and H 1 all infect wheat, oats, and grasses.

Sand culture experiments (details of which are reserved for future publication) showed that the development of *C. herpotrichoides* is promoted by phosphorus and nitrogen deficiency, which reduced the grain yield by 100 per cent. as compared with an average diminution of 25 per cent. in inoculated plants receiving a normal supply of nutrients. The grain and straw yields of Carstens V winter wheat were augmented by the application to the light soil of calcium cyanamide (275 or 350 kg. per hect.) in November and February.

Generally speaking, there are no marked differences in varietal reaction to *C. herpotrichoides* in the winter wheats commonly grown in Holland, though Queen Wilhelmina and Hohenheim may be ranked as moderately resistant. However, in a test conducted by Mayer Gmelin in 1935, seven varieties, including Juliana and Carstens V, showed only 10 to 20 per cent. lodging due to the fungus, while 30 to 40 per cent. was observed in Wilhelmina and three others, and 50 to 60 per cent. in five. While early winter sowing increases the risk of infection, there is no certainty that late plantings will escape the disease or give larger yields than the early ones.

C. herpotrichoides was isolated from a soil suspension and it is thought that the soil constitutes the primary source of infection [ibid., xv, p. 709]. The fungus is harboured by diseased stubble, which is not, however, an important source of contamination in practice; the same applies to wild grasses.

Too frequent successions of wheat and barley should be avoided as contributing to increased virulence on the part of the fungus, but both these crops may safely be preceded in Holland by peas or clover, while oats are not unfavourable. Rispens (*LandbBl., Groningen*, xvii, 4, 1935) found that shallow sowing indirectly diminishes the incidence of eye spot by producing vigorous plants with flat tillers, while shallow ploughing (contrary to the advice of certain German workers [*R.A.M.*, xiv, p. 748]) is recommended by other Dutch investigators. Vernalization

[ibid., xv, p. 785] effectively combated eye spot in Juliana wheat, but this mode of control is impracticable under Dutch conditions.

JANOVA [YANOVA] (Mme N.). Характеристика паразитических свойств некоторых фузариумов на Пшенице по количеству аминного азота. [Determination of the parasitic properties of some *Fusarium* species parasitizing Wheat by their amine nitrogen production.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 496–498, 1936.

The results of the work summarized in this paper confirmed the diagnostic value of amine nitrogen production by species of *Fusarium* in relation to their pathogenicity [*R.A.M.*, xv, p. 456], and showed that this relationship holds true even between strains of one and the same species. Thus, of three strains of *F. avenaceum* collected from three different regions of the U.S.S.R., the most virulent (from the Leningrad area) accumulated 0·33 mgm. amine nitrogen per unit of weight, while the other two produced 4·6 and 4·7 mgm., respectively. Of three strains of *F. graminearum* [*Gibberella saubinetii*], the two most virulent accumulated 4·4 and 8·4 mgm., respectively, while the third, a weak parasite, produced 18·4 mgm. amine nitrogen.

POHJAKALLIO (O.). **Valkotähkäisyystutkimuksia Jokioisissa kesällä 1935.** [Investigations on white ear conducted at Jokioinen in the summer of 1935.]—*Valt. Maatalousk. Julk.* 77, 78 pp., 17 figs., 2 diags., 1936. [Finnish, with German summary.]

White ear [*R.A.M.*, viii, p. 304; xv, p. 355] of cereals and grasses was limited in 1935 in the Jokioinen district of Finland to certain well-defined areas, such as dry slopes and the banks of ditches, where the affected species included *Alopecurus pratensis*, *Phleum pratense*, *Festuca pratensis*, and *Poa trivialis*. These grasses suffered from the so-called 'total' form of the disease, in which the ears turn pale and die without impairing the vitality of the rest of the plant, but in the case of cereals the symptoms were only partial. Many factors are involved in the etiology of the disease. A definite etiological relationship was established between *Mastigosporium album* [ibid., viii, p. 301] and white ear in *A. pratensis*, the discoloured internal tissues of the haulm and leaf sheath of which contained the hyphae of the fungus. Water shortage was shown to be largely responsible for partial white ear in *A. pratensis*, *P. pratensis*, and *Phleum pratense* [ibid., x, p. 490]. In oats (Pelso variety) and summer wheat the condition was experimentally induced by deficiency of nutrient materials, while both excess and absence of shade seemed to favour the disorder in oats. White ear symptoms may also develop as a sequel to pressure and friction between the haulm and leaf sheath, which lead to curvature and rupture in the meristematic growth zone of the haulm, and to attacks by mites (*Pediculopsis graminum*) and other insects.

MARKHASSEVA (Mme V. A.). Методика прогноза развития спорыньи (**Claviceps purpurea Tul.**). [A method for the prognosis of the development of ergot (*Claviceps purpurea* Tul.).]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 535–537, 1936.

A summary is given of observations made in 1935 in the Leningrad

and Kieff regions, greatly differing from one another in environmental conditions, with a view to determining the factors most favourable for the initiation and development of rye ergot (*Claviceps purpurea*). The evidence indicated that the ergot sclerotia in the soil germinate in the spring at a minimum temperature slightly above 10° C. and most freely at soil moisture content round about 22 per cent. The most vigorous development of the perithecial stromata occurred at soil temperatures of 17·3° to 21·2° and with soil moisture of 15 or 16 per cent.; higher temperatures and lower soil moisture tended to delay their development. In the north the development of asci in the perithecial heads began eight days and in the south five days after the emergence of the stromata from the soil, and ascospore discharge began on the 15th day in the north and on the 7th day in the south. In the Kieff region the discharge of the ascospores coincided with the end of the blossoming stage of the early rye sowings, later crops being in full bloom at that time. Infection in 1935 was not abundant in the neighbourhood of Kieff, owing to high air temperatures and low air humidity.

Field observations near Kieff indicated that 100 per cent. of the larger ergot sclerotia fall out of the ears at commercial maturity of the rye; 80 per cent. of the medium-sized sclerotia also drop out, but all the smaller sclerotia are retained in the ears. While these results are admittedly only preliminary, it is hoped that further studies on these lines may eventually provide data on which further outbreaks of the disease may be forecast with some degree of accuracy.

Barnette (R. M.), Camp (J. P.), Warner (J. D.), & Gall (O. E.). **The use of zinc sulphate under Corn and other field crops.**—*Bull. Fla agric. Exp. Sta.* 292, 51 pp., 14 figs., 1936.

After briefly describing the symptoms of 'white bud' of maize [*R.A.M.*, xiv, p. 576] in Florida, the authors give a detailed and fully tabulated account of experiments, the results of which showed that the severity of the disease may be materially reduced by fallowing the affected soils for one or two years. With soils on which the disease had been severe for several years, the application (in the row) of 10 to 20 lb. of 89 per cent. zinc sulphate per acre, in conjunction with the separate application of a complete inorganic fertilizer (nitrate of soda, superphosphate, and muriate of potash), gave the best control of white bud and considerably increased the yield in grain. The efficacy of a dressing with nitrate of soda alone or urea in addition to superphosphate and muriate of potash was increased, especially in the case of the latter, by the application of zinc sulphate in the row before sowing maize.

Pathological symptoms were also observed on velvet bean [*Mucuna deeringiana*], cowpea, and pearl millet [*Pennisetum typhoides*] plants grown on soil deficient in zinc, but were absent from plots receiving zinc sulphate in the row before planting. While no symptoms occurred on groundnuts, oats, sugar-cane, Napier grass [*P. purpureum*], *Crotalaria spectabilis* [*C. sericea*], and *C. intermedia* grown on land producing white bud in maize, their yield was definitely increased by the application of zinc sulphate before planting.

WAGNER (F. A.). **Reaction of Sorghums to the root, crown, and shoot rot of Milo.**—*J. Amer. Soc. Agron.*, xxviii, 8, pp. 643–654, 4 figs., 1936.

A description is given of the root, crown, and shoot rot of milo sorghums due to *Pythium arrhenomanes* [*R.A.M.*, xv, p. 435], which occurs in Kansas, Texas, New Mexico, and possibly California and Oklahoma. Adjustments in the ordinary methods of cultivation, crop rotation, and the like, are powerless to combat the disease, and attention has therefore been directed to the development of resistant varieties. A table shows the reactions to the fungus of a large number of standard varieties, selections, and crosses tested during the period from 1930 to 1934. Among the most susceptible were Pygmy (Two-Foot) milo (C.I. 480×C.I. 332) 45–134, Wheatland Back-cross (C.I. 918×C.I. 332) 1–2, Wheatland (C.I. 918), Early White milo (C.I. 480), darso, Sooner milo, Beaver, Day milo, and Dwarf Yellow milo, while kafirs, feteritas, and most sorgos proved highly resistant. Among the milo crosses giving promising indications in respect of resistance were Kalo, Dwarf feterita×(milo×kafir) (H.C. 312), milo×hegari, Woodward selections 13–10, 14–11, and Hays selection H.C. 282, kafir×milo, Woodward selections 38–1–2–1, 10–1–29, and 8–2–6, and Dwarf Yellow milo×Dwarf Freed, Hays selection 339. Fargo (C.I. 809) and Manko maize are the only two varieties of the Dwarf Yellow type showing natural immunity from the milo disease, a property shared by Dwarf Freed (C.I. 971), Grohoma, hegari, and Sudan grass [*Sorghum sudanense*], and apparently by the forage variety Rex sorgo. Resistant strains of the ordinarily susceptible Dwarf Yellow milo, Wheatland, and Beaver have been developed and it is hoped that seed of these selected stocks may shortly be available for distribution.

SPERONI (H. A.). **Argentine Republic: further contribution to the study of the disease known as 'podredumbre de las raicillas' [rootlet rot] of Orange trees.**—*Int. Bull. Pl. Prot.*, x, 8, pp. 169–170, 1936.

An account has already been given of an orange disease in Bella Vista, Corrientes, Argentine Republic, characterized by general stunting, chlorosis, or foliocellosis (veins yellow, interveinal parts green or vice versa), a rosette-shaped arrangement of the abnormally small leaves, and disorganization of the fine rootlets [*R.A.M.*, xiii, p. 436; xv, p. 716]. The disorder is believed to be of physiological origin, being favoured by the presence in the acid local soils of excesses of iron and aluminium salts and various cultural defects, including inadequate drainage, unduly deep planting, lack of green manures, and soil exhaustion through repeated cropping. Beneficial results were obtained in 90 per cent. of the cases treated by the injection of 10 per cent. iron sulphate at the rate of 10 c.c. (or insertion as crystals), followed by the application of slaked lime (3 to 4 kg. per tree). Satisfactory control was also given by liming as indicated and watering the trees with a solution containing 250 to 300 gm. iron sulphate at the rate of 20 l. per tree [ibid., xv, p. 496].

PERLBERGER (J.). **Phytophthora stem and tip blight of Citrus seedlings.**—Reprinted from *Hadar*, ix, 6–7, 23 pp., 9 figs., 1936.

In the winter of 1932 sweet lime [*Citrus limetta*] seedlings in Palestine

developed a brown or black blight, usually beginning at the growing point and spreading to the leaves and main stem. Sometimes it started lower down the stem, spreading first to the lower leaves and later to the higher ones. Usually, but not invariably, the root and root-collar remained unaffected. The infected material showed the presence of *Phytophthora parasitica* and *P. citrophthora* [cf. *R.A.M.*, xv, p. 575] (rarely found together) and, occasionally, of two unidentified species of *Phytophthora*.

Inoculations of wounded and unwounded sweet lime and sour orange seedlings with isolations of *P. parasitica* and *P. citrophthora* gave negative results, though successful infection was obtained on the fruits. In attempts to secure infection through soil, 100 sweet lime seeds from healthy fruits were sown in pots on sterilized soil, inoculated with the two organisms. Of the two cultures of *P. citrophthora* used one gave a small and the other a high percentage of healthy seedlings, and a similar result was obtained with *P. parasitica*; this variation in virulence of the cultures is thought to be due to attenuation. The results of the inoculation experiments indicate that a large part of the seeds from fruit infected with *P. citrophthora* or *P. parasitica* is killed inside the fruit, that many of the remainder rot in the earth before germinating, and some become infected shortly after germination. Observations showed that sour orange is highly resistant to *Phytophthora* infection.

Control measures recommended are the use of seed from whole, healthy fruits picked from the tree, disinfection of the seed-bed soil with a 1 in 100 formaldehyde solution, treatment of the seed with uspulun or ceresan 1 in 1,000 for 30 minutes, the use of cold seed-beds of low humidity, and spraying the seedlings within a week after germination with 0·5 per cent. Bordeaux mixture, the application being repeated at double strength 10 days later. All infected seedlings should be removed.

MALENÇON (G.). **Données nouvelles sur le bayoud.** [New data on baïoud disease.]—*Rev. Mycologie*, N.S., i, 4, pp. 191–206, 5 pl., 1 map, 1936.

The author's observations lead him to consider that epidemic outbreaks of baïoud disease (*Fusarium albedinis*) of the date palm [*R.A.M.*, xiv, p. 302] in Morocco are due to temporary environmental factors acting upon infections long present in an attenuated form. Thus, a severe attack occurred a few years ago in an arid locality following a wet year, in which the natives, who leave the trees untouched as long as they are unproductive, had resorted to drastic pruning. In palms deprived of water, the disease develops very slowly and the symptoms so much resemble those of drought that they usually escape attention. But when the water deficiency is suddenly rectified, the activity of both host and pathogen is stimulated, and numerous previously tolerant individuals, wrongly regarded hitherto as unaffected, are killed off. That this outbreak continued to spread indicates, in the author's opinion, the presence of a more virulent strain of the fungus, developed in response to the increased resistance offered by the trees during drought, and to the effect of the drought on the fungus itself.

Repeated laboratory tests showed that in dry conditions micro-

conidial production by *F. albedinis* is reduced and the formation of macroconidia stimulated, and that colonies derived from the latter show renewed vigour. If, therefore, sudden moisture favours conidial production by a fungus that has retained a high degree of virulence, and at the same time the trees are subjected to drastic pruning, conditions favourable to an epidemic outbreak are produced. As the epidemic spreads, microconidia are continually produced, and virulence is reduced, as indicated by laboratory tests. The epidemic gradually declines until a balance is reached between the factors affecting the attack, at which point the disease assumes the slow, latent form in which it is generally present.

A further geographical survey showed conclusively that in Morocco baïoud is strictly confined to those regions which possess a typical Sahara climate, unaffected by maritime influences.

KAPSHUK (A. A.). Испытание сернистых соединений на группе бактерий, возбудителях гнили овощей и пятнистости Табака, Фасоли, Пшеницы и гоммоза Хлопчатника. [Tests of the toxicity of sulphur compounds to the group of bacteria causing rots of vegetables and spotting of Tobacco, French Beans, and Wheat, and gummosis of Cotton.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 517–518, 1936.

Field experiments in 1934 in North Caucasus showed, *inter alia,* that cotton seed naturally infected with *Bacterium malvacearum*, which was exposed for 72 hours to an atmosphere containing 750 gm. hydrogen sulphide [see above, p. 26] per cu.m. enclosed space, gave rise to plants that showed only 1·25 per cent. gummosis, as against 18 per cent. in the crop from untreated seed; formalin (1 in 100) treated seed gave 1 per cent. infection at the same stage. Hydrogen sulphide caused a serious discoloration of the two cotyledonary leaves at first, but on the whole had a stimulatory effect on the growth of the plant.

KRUG (H. P.). **A podridão interna dos capulhos do Algodeiro no estado de São Paulo.** [Internal boll rot of Cotton in the State of San Paulo.]—*Bol. techn. Inst. agron. Campinas* 23 (I), 19 pp., 1 col. pl., 1936.

A summary is given of the available information on the history, host range, distribution, economic importance, symptoms, and etiology of internal boll rot of cotton (associated with bacteria, *Nematospora coryli*, *N. gossypii*, yeasts, and *Penicillium* sp.) [*R.A.M.*, xv, p. 437], which was recorded during 1936 from six Experimental Stations in San Paulo, Brazil, viz., Santa Elisa, Pindorama, Riberião Preto, Tatuhy, Tietê, and Tupy, causing 1·5 to 8 per cent. infection. Of the above-mentioned agents, bacteria appear to be the most active in the causation of the disorder, which is transmitted by *Dysdercus* spp. and other sucking insects. In this way infection is conveyed to various wild and cultivated Malvaceae, such as *Sida* and *Hibiscus,* and so perpetuated. *N. coryli* was isolated at Campinas from cowpeas, from which it may be transmitted to cotton by *Nezara viridula*.

HOPKIRK (C. S. M.). **Paspalum staggers.**—*N.Z. J. Agric.*, liii, 2, pp. 105–108, 2 figs., 1936.

In April, 1935, cattle in two localities in New Zealand became affected with a form of staggering when grazing on seeding paspalum [*Paspalum dilatatum*] infected with ergot (*Claviceps paspali*). Although paspalum ergot does not appear to have been present before in New Zealand [cf. *R.A.M.*, xv, p. 809], by 1936 all the stands in North Island were visibly affected.

LINTON (E.). **A fungoid parasite in the kidney of the Butterfish (Poronotus triacanthus).**—*Trans. Amer. micr. Soc.*, lv, 1, pp. 93–96, 1 pl., 1936.

In 1913, while examining butterfish (*Poronotus triacanthus*) for helminth parasites at Woods Hole, Massachusetts, the writer detected in the kidney about 100 thin-walled cysts, 3 to 5 mm. in diameter, containing branching structures, frequently terminating in knob-like enlargements, 0·5 to 0·8 mm. in diameter, and consisting of a readily stainable granular protoplasm, enclosed in a thin, very lightly staining investment. This is composed of two layers, the outer loose, fibrous, readily detachable, often appearing as a yellowish mass lying along the débris of the crushed cyst, the inner thin and closely adhering to the granular material. Similar observations were made on subsequent dates in the same year and again in 1914. No definite place in any taxonomic group has yet been assigned to the organism, but an affinity with the Basidiomycetes has been suggested.

POSPELOFF (V. P.). Результаты работ лаборатории болезней насекомых по разработке микробиологического метода борьбы с вредными насекомыми. [Results of the work accomplished by the Laboratory for Insect Diseases in the development of a system for the microbiological control of harmful insects.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 318–321, 1 fig., 1936.

The author states that experiments in 1934 in the neighbourhood of Leningrad and in the Moldavian Soviet Republic showed that in both regions excellent control of the cabbage and turnip butterflies [*Pieris brassicae* and *P. rapae*] was obtained by spraying the host plants with a suspension of Métalnikov's bacillus [*R.A.M.*, xv, p. 292], which is said to belong to the *Bac.* [*Bacterium*] *pirenei* type. In the laboratory the bacillus killed up to 100 per cent. of the maize borer larvae [*Pyrausta nubilalis*], but in the open it only caused 40 to 45 per cent. mortality of the larvae on experimental maize plants and 35 per cent. in commercial maize fields; the yield of the treated field plots was increased by 32·2 per cent. It was further observed that in the sprayed maize plots the amount of smut (*Ustilago maydis*) [*U. zeae*] was reduced by 75 per cent. and laboratory tests showed that the bacillus brought about the complete lysis of the *U. zeae* spores. Likewise, in paired cultures the bacillus completely suppressed the growth of a *Fusarium* species which was isolated from decayed soy-beans. These results indicate the eventual possibility of using Métalnikov's bacillus for the control of certain pests and parasitic fungi, the more so as the organism is innocuous to man and higher animals.

Cephalosporium lecanii [ibid., xiv, p. 305] was found to be very widespread on scale insects of citrus along the whole coast of the Black Sea, and was frequently isolated from species of *Pulvinaria, Coccus, Saissetia, Ceroplastes, Lecanium*, and *Eucalymnatus*, in the natural control of which it evidently plays a considerable part. Isolations from *Aonidiella aurantii* scales yielded an unidentified species of *Cladosporium*, and another species of this genus was found causing a heavy epidemic among *Pseudococcus citri* in citrus hothouses in Leningrad in 1934. A strain of *Bacillus prodigiosus* and a species of *Blastodendrion* both isolated from unspecified scale insects were experimentally proved to be pathogenic to other insects of the same kind. *Metarrhizium anisopliae* [ibid., xv, p. 499] was isolated from dead larvae of the rhinoceros beetle, *Spicaria fumoso-rosea* [ibid., ix, p. 309] from dead larvae of *Agrotis exclamationis, Botrytis tenella* [? *Beauveria* sp.: cf. ibid., i, p. 355; vi, p. 481] from dead cockchafer larvae, and *Beauveria* sp. and *Sorosporella* from dead larvae of *A. segetum*.

FAES (H.). **La préservation des plantes cultivées. D'une part, par la protection des auxiliaires naturels; d'autre part, par l'élevage et la multiplication d'animaux et végétaux ennemis des déprédateurs et parasites.** [The preservation of cultivated plants: on the one hand, by the protection of natural adjuncts, and on the other, by the breeding and propagation of animal and vegetable enemies of pests and parasites.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 759–773, 1936.

The possibilities of combating plant pests by the protection or, where necessary, the introduction and propagation of their natural enemies (insects and fungi) are discussed in relation to the climatic conditions governing the development both of the controlling agents and of the pathogens to be eliminated.

WILLIAMS (J. W.). **II. Effect of variation of ratios of dextrose to peptone on colonies of certain pathogenic fungi.**—*Arch. Derm. Syph., Chicago*, xxxiv, 1, pp. 15–34, 1936.

Continuing his studies on the effect of variation in the ratios of dextrose to peptone on the colonies of a number of human pathogenic fungi [*R.A.M.*, xv, p. 294], the writer fully discusses this phenomenon in relation to the physico-chemical characteristics of the medium—surface tension, osmotic pressure, and viscosity. A substratum consisting of 4 per cent. peptone, 1 per cent. dextrose, and 1·5 per cent. agar, at a P_H range from 5·2 to 8 has been found very useful in stabilizing the morphological characters of the fungi under observation and thereby assisting in their classification. Pigment production has also been used as a basis of differentiation. Great importance is attached to the correlations between physico-chemical features of the media (e.g., surface tension, as measured by an interfacial tensiometer, and osmotic pressure) and the morphology of the colonies.

EMMONS (C. W.) & CARRIÓN (A. L.). **Hormodendrum pedrosoi. An etiological agent in chromoblastomycosis.**—*Puerto Rico J. publ. Hlth*, xi, 4, pp. 639–650, 6 pl., 1936. [Spanish translation on pp. 651–662.]

The fungus responsible for most cases of chromoblastomycosis in

South America and Porto Rico is *Hormodendrum pedrosoi* Brumpt 1922 (syn. *Acrotheca pedrosoi*, *Trichosporium pedrosoi*, and *T. pedrosianum*) [*R.A.M.*, xv, pp. 720, 804 and next abstract]. The affinities of the pathogen with the saprophytic representatives of the genus are shown by its similar but slower growth habit, its characteristic greenish-grey to olive-black pigmentation on Czapek's and Sabouraud's maltose agars, and its production of branching chains of conidia, which excludes it from either *Acrotheca* or *Trichosporium*. The conidial dimensions vary greatly according to their position on the chains, those at the base measuring 7 to 10 (up to 13) by 2·5 to 3·5 μ and those at the tip 3 to 5 by 1·5 to 3 μ. The conidia are borne in heads of five more or less overlapping types. The subterminal elements of the chains are true spores and not parts of the conidiophore, as shown by their mode of development, transitional forms, and ready germination. The so-called 'disjunctors' (narrowed spore ends and the surrounding thickened walls) are present in *H. pedrosoi* as well as in the saprophytic species of the genus, while in common with at least one of the latter it occasionally forms conidiophores and conidia of the *Phialophora verrucosa* type. Successful animal (rat) inoculations with saprophytic species of *Hormodendrum*, e.g., *H. elatum*, corroborate the evidence already presented for a close relationship between the parasitic and saprophytic members of the genus.

EMMONS (C. W.) & CARRIÓN (A. L.). **The Phialophora type of sporulation in Hormodendrum pedrosoi and Hormodendrum compactum.**—*Puerto Rico J. publ. Hlth*, xi, 4, pp. 703–710, 5 pl., 1936. [Spanish translation on pp. 711–719.]

Fifteen strains of fungi from cases of chromoblastomycosis were studied, twelve being assigned to *Hormodendrum* and three to *Phialophora*. In all the strains of *H. pedrosoi* [see preceding abstract] and *H. compactum* investigated, the *Phialophora* type of sporulation was observed, a fact considered to demonstrate the close relationship existing between the three agents of chromoblastomycosis. The *Phialophora* type of conidiophore in *Hormodendrum* may arise through a modification of one or two conidia in an otherwise typical *Hormodendrum* head, or it may appear as an isolated lateral or terminal branch at a variable distance from the *Hormodendrum* conidiophores. Aberrant strains of both *H. pedrosoi* and *P. verrucosa* were observed, but the authors are not inclined to attach great taxonomic significance to this phenomenon.

MOORE (M.). **Chromomycosis.**—*Folia biol., B. Aires, 1936*, 61–65, pp. 266–269, 1936. [Spanish translation.]

Chief among the fungi responsible for chromomycosis in South America is *Botrytoides pedrosoi* (Brumpt) Moore & Almeida [*R.A.M.*, xv, p. 720, and cf. preceding abstracts] stated to be characterized chiefly by the conidiophores which may be single, simple or branched, successive, terminal, lateral, or intercalary. *Phialophora verrucosa* has been reported from Uruguay in this connexion [ibid., xiv, p. 509] and one of the fungi found by Pedroso and Gomes in 1920 to be associated with the disease has been recognized as a new species, *P. macrospora* Moore & Almeida.

The *Hormodendrum* isolated from authenticated cases of chromoblastomycosis in Brazil and referred by Langeron to *Trichosporium pedrosoi* [ibid., viii, p. 645] is stated to have the properties both of this genus and *Botrytoides* and should therefore be placed in a new genus for which the name *Hormodendroides* is proposed [without a Latin diagnosis]. The genus *Phialoconidiophora* has the cup formation of *Phialophora*, the conidiophores of *Botrytoides*, *Hormodendroides*, and *Hormodendrum* and a peculiar 'cup' formation on conidiophores of the *Hormodendrum* type, while each of the other four genera shows a more or less complete loss of these characters. In the affected tissues, the cells are apparently similar for all the five genera, the representatives of which it is concluded may produce the disease.

LANGERON (M.). & BAEZA (M.). **Sur les dermatophytes qui causent la teigne faveuse humaine.** [On the dermatophytes which cause human faviform ringworm.]—*Ann. Parasit. hum. comp.*, xiv, 4, pp. 395–402, 6 pl., 1936.

As a result of their studies on the organisms isolated from 304 cases of human favus in the Spanish Protectorate of Morocco the authors differentiate, as foreshadowed in a previous communication [*R.A.M.*, xiv, p. 102], six different types, viz., *Achorion schoenleini* [ibid., xv, p. 579], and five new species named [without Latin diagnoses] *A. pittalugai*, *A. talicei*, *A. debueni*, *A. brumpti*, and *A. milochevitchi*, respectively. While all these species are generally characterized by more or less glabrous colonies on Sabouraud's medium, *A. schoenleini* on this medium produces a strictly superficial, spongy, irregular growth which does not apparently develop below the surface, while the four next-named give a rather adherent growth, slightly penetrating the surface of the medium, and the last-named chiefly develops below the surface, where the growth is radiating and regular. Apart from these growth differences, the species differ from one another in the number, disposition, and nature of the organs that develop in polysaccharide media, such as 'chandeliers faviques', which are interpreted as modifications of the mycelium due to unsuitable medium; catenulate and single chlamydospores, which like the aleuria are present in some species; and nodules, which may be agglomerations of conjugating hyphae. True spindles were not found, the spindle-like structures that were observed possibly being either aborted spindles or large fusiform chlamydospores.

These results are considered to dispose of Sabouraud's assertion that human favus is caused by *A. schoenleini* alone, a conclusion supported by the discovery in other parts of the world of other species or varieties of *Achorion*, some of which are very reminiscent of certain forms described in this paper. They would further indicate a close botanical relationship between the genera *Achorion* and *Trichophyton* which might be reunited into one common group under Neveu-Lemaire's name *Favotrichophyton* [cf. ibid., iii, p. 597], comprising three sections: (1) for species of *Trichophyton* with endo-ectothrix megaspores (namely, *T. album*, *T. discoides*, *T. ochraceum*, *T. bullosum* [ibid., xiv, p. 103], *T. papillosum*, and *T. pruinosum*) [ibid., xiii, p. 577]; (2) for those typical of *Achorion*, including the species discussed above; and (3) for

species with endothrix spores, subdivided into section (*a*) for the microsporous forms (*T. concentricum*, *T. roquettei*, and *T. langeroni*) corresponding to *Endodermophyton*, and (*b*) for the macrosporous forms (*T. violaceum*, *T. glabrum*, and *T. gourvili* [loc. cit.]) corresponding to *Bodinia*.

BONÉ (G.). **Les Monilias.** [The Moniliae.]—*C.R. Soc. Biol., Paris*, cxxii, 27, pp. 803–805, 1936.

The six strains of *Monilia* isolated from human patients at Louvain, Belgium, were antigenically identical and fell into Lamb's group I, comprising *M.* [*Candida*] *albicans*, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*: *R.A.M.*, xiv, p. 444]. To the same category belonged a yeast (*Monilia*) [*Candida*] from the Institut Carnoy. The beer yeasts and wild *Torulae* examined for comparative purposes were found to contain different antigens.

ALMON (LOIS), PESSIN (S. B.), & STOVALL (W. D.). **Dietary deficiencies and resistance to infection by Monilia.**—*J. infect. Dis.*, lix, 1, pp. 54–59, 1936.

No evidence of increased susceptibility to infection by *Monilia* [*Candida*] *albicans*, *M. candida* [*C. vulgaris*], and *M.* [*C.*] *parapsilosis* [see preceding abstract] due to an inadequate dietary (deficiency of vitamins A, C, and D, excess of egg white) in rats and rabbits could be detected. All cases of pneumonia in the treated animals showing the fungi in the tissues could be duplicated in normally nourished controls. The organisms may remain for several days in the digestive tract without inducing symptoms or pathological changes. Unless the lungs are diseased, or become so, the fungi do not persist in these organs. It has not been definitely established whether any of the lung changes observed in the experimental animals were due to *C. albicans*.

MACKINNON (J. E.) & RODRIGUEZ-GARCIA (J. A.). **Mesure et comparaison du degré de virulence des champignons levuriformes.** [The measurement and comparison of the degrees of virulence of the yeast-like fungi.]—*Ann. Parasit. hum. comp.*, xiv, 4, pp. 403–407, 1936.

The results of experiments outlined in this paper showed that the species of yeast-like fungi most virulent to the rabbit are referable to Langeron's and Talice's genera *Mycotorula* and *Candida* [*R.A.M.*, xi, p. 476]; the pathogenic species of *Mycotoruloides* and *Geotrichoides* [ibid., xv, p. 368] come next in virulence, while those of *Mycocandida* for the most part are either non-pathogenic or nearly so. Of the four forms of *Blastodendrion* that were tested, three were non-pathogenic and one had an attenuated degree of virulence. All the yeast-like fungi isolated from human or animal lesions were more or less virulent to the rabbit, while those from healthy skin were non-pathogenic, and it is believed that the degree of virulence is stable enough to be used as a diagnostic character in conjunction with morphological and biological criteria.

DILLMAN (A. C.). **Improvement in Flax.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 745–784, 10 figs., 1936.

In this detailed account of the breeding of improved flax varieties the author reviews the progress made in the production of strains resistant to wilt [*Fusarium lini*: *R.A.M.*, xii, p. 95] and rust (*Melampsora lini*) [ibid., xv, p. 805]. He states that varieties and selections resistant when first developed become less resistant later on, or when grown in a different locality, possibly owing to the existence of different physiologic forms of the fungus. Some varieties, such as Bison, Buda, and Argentine are, however, resistant over a wide area, and are, therefore, valuable parents for breeding work.

WERNECK (H. L.). **Eine neue Krankheit und ein neuer Schädling an der Weberkarde in Oberösterreich.** [A new disease and a new pest on Fuller's Teasel in Upper Austria.]—*Neuheiten PflSch.*, xxix, 4, pp. 137–138, 1936.

A number of fuller's teasel [*Dipsacus fullonum*] plants from Steyregg, Upper Austria, submitted to the Linz Agricultural Experiment Station for inspection in May, 1936, were found to be heavily infected by downy mildew (*Peronospora dipsaci*), which was reported to have destroyed extensive stands of the crop in the locality of origin.

BROWN (NELLIE A.). **Privet and Jasmine galls produced by a species of Phomopsis.**—*Phytopathology*, xxvi, 8, pp. 795–799, 1 fig., 1936.

A *Phoma* was isolated from nodular galls causing a severe disease of privet (*Ligustrum vulgare*) in the District of Columbia and inoculated into the same host with positive results in 50 and 60 per cent. of the outdoor and greenhouse series, respectively, the excrescences reaching a diameter of 3 cm. in 5½ months. Wounding is apparently necessary for infection. The fungus was reisolated from the diseased tissues and successfully reinoculated on privet. *L. amurense* Carr., olive, and winter jasmine (*Jasminum nudiflorum*) are also susceptible to inoculation with the *Phoma* from *L. vulgare*. In the southern States an apparently identical fungus forms finely nodular galls on winter jasmine, isolations from which produced galls on the same host and on *L. vulgare*. The privet disease also occurs in the South, where it has been erroneously attributed to *Bacterium tumefaciens* [cf. *R.A.M.*, xv, p. 782], four virulent strains of which failed to infect this plant in the writer's experiments. The *Phoma* stage is produced in great numbers in culture, but the pycnidia on galls kept for ten months at 12° C. exuded *Phomopsis* spores, including the scolecospore type, on removal from the refrigerator and moistening.

EHRENBERG (P.). **Zusammenfassende Betrachtungen zur Eisenversorgung von Kulturpflanzen.** [Comprehensive observations on the supply of cultivated plants with iron.]—*Z. PflErnähr. Düng.*, A, xlv, 1–2, pp. 1–55, 1936.

This is a comprehensive survey, supplemented by explanatory observations and copious bibliographical references, of contemporary literature on the iron requirements of cultivated plants, with special

reference to lime-induced chlorosis of lupins in Germany [*R.A.M.*, xv, pp. 373, 585].

THOMAS (L. A.). **Calcium deficiency in Apple trees at Stanthorpe (Q.).**—*J. Coun. sci. industr. Res. Aust.*, ix, 3, pp. 235–236, 1936.

To ascertain whether blotches on the leaves of Jonathan apple trees and a wine-coloured discoloration of the leaves of Gravenstein trees growing in an orchard at Stanthorpe, Queensland, were due to calcium deficiency [*R.A.M.*, xv, p. 663] the following treatments were carried out on Jonathan trees: (1) quicklime, 2 tons per acre, applied on 12th April, 1934, (2) the same, 1 ton per acre (10th July, 1934), with muriate of potash 5½ lb. per tree (2nd May, 1934), and (3) the muriate of potash application only. Other trees remained untreated as controls. In 1935–6 the blotching had practically disappeared from the lime-treated trees, while it was present to a moderate extent on the controls and was most marked on the trees given the potash. It is suggested that in the case of trees with a low calcium content, further intake of potassium accentuates the unbalanced state of the ions and so intensifies the calcium deficiency symptoms. In another orchard deficiency symptoms were pronounced on Jonathan trees which had received no lime, but barely evident on others limed six months earlier.

So far the wine colour of the leaves has not been observed on the Jonathan variety and this symptom cannot be relied upon as diagnostic of lime deficiency, especially as wine-coloured leaves on plums late in summer generally signify that the branch or tree is dying.

MCLARTY (H. R.). **Tree injections with boron and other materials as a control for drought spot and corky core of Apple.**—*Sci. Agric.*, xvi, 12, pp. 625–633, 1 fig., 1936. [French summary.]

This is a tabulated report of the preliminary results of experiments from 1932 to 1935 in British Columbia on the control of drought spot and corky core of apples [*R.A.M.*, xii, p. 769; xv, p. 446], two physiological disorders that cause serious economic losses in the Okanagan and Kootenay valleys. Injections into the trunk and main limbs of thirty different chemicals [which are listed], either alone or in combination with one another, gave significant control of both conditions only when boron was used (either as manganous borate or boric acid), at doses over 0·48 gm. boric acid per 100 sq. cm. of trunk cross-sectional area for drought spot, and over 1·83 gm. for corky core. In the 1934–5 season, the average yield of saleable fruit of boron-treated trees was increased from 3·61 to 10·6 boxes per tree, whereas on control trees it fell on the average from 3·8 to 2·5 boxes. The amounts of boric acid used (up to 5·92 gm.) did not cause injury to the foliage, but slight injury was noticed at the points of injection.

BIRMINGHAM (W. A.). **Crown gall: a warning to fruitgrowers.**—*Agric. Gaz. N.S.W.*, xlvii, 8, p. 464, 1936.

Almond and pear trees sent from a nursery to a grower in the Murrumbidgee Irrigation Area were found to be infected by crown gall (*Bacterium tumefaciens*), which is chiefly introduced into clean areas on

nursery stock. Growers are recommended to reject all stocks showing suspicious outgrowths.

SCHNELLHARDT (O.) & HEALD (F. D.). **Pathogenicity tests with Botrytis spp. when inoculated into Apples.**—*Phytopathology*, xxvi, 8, pp. 786–794, 3 figs., 1936.

Stored apples in Washington are liable to a destructive rot caused by a *Botrytis* of the *cinerea* type [*R.A.M.*, xv, p. 732] whenever the harvesting period is accompanied by considerable rain. The fungus advances more rapidly on fruit in cold storage than the agent of blue mould [*Penicillium expansum*: ibid., xiv, p. 592]. Isolations of *B. cinerea* (type) from apple and pear fruits, pea pods, dogwood [*Cornus mas*] and blueberry [*Vaccinium* spp.] twigs, geranium [*Pelargonium*] and *Gloxinia* shoots, *Feijoa* [? *sellowiana*: ibid., xv, p. 593], and guava (all in the United States), apple fruits from British Columbia and an English culture probably from the same host, and one from *Crassula perforata* (W. B. Brierley's strain producing albino sclerotia) caused a severe decay of Jonathan apples at room and storage temperatures. A higher degree of pathogenicity was manifested by recently isolated species than by those maintained for some time on artificial media. The *Botrytis* isolated from *Gloxinia* consistently produced a light red pigment in culture [ibid., v, p. 746]. *B. trifolii* [ibid., xiii, p. 520], *B. fabae* [ibid., xiv, p. 734], and *B. tulipae* [ibid., xv, p. 807] were only weakly parasitic and appear to be of little importance in apple decay. The limited data yielded by these studies are held to indicate that the grey moulds of fruits, vegetables, and ornamentals are interchangeable, in which case the first-named would obviously be exposed, in the course of packing and storage operations, to numerous potential sources of inoculum.

BROOKS (C.), BRATLEY (C. O.), & MCCOLLOCH (L. P.). **Transit and storage diseases of fruits and vegetables as affected by initial carbon dioxide treatments.**—*Tech. Bull. U.S. Dep. Agric.* 519, 24 pp., 1 graph, 1936.

In experiments on the use of carbon dioxide gas as a supplement to cold storage [*R.A.M.*, xii, p. 102; xv, p. 299], decay in sweet cherries (mostly *Rhizopus* [*nigricans*: ibid., xii, p. 378], though some was due to *Penicillium*) was retarded equally well by gradual cooling in 30 per cent. or more of the gas as by immediate storage at 32° F. With cherries inoculated with *Monilia* [*Sclerotinia*] *fructicola*, *Cladosporium* sp., and *R. nigricans*, even better results were obtained.

Decay in apricots inoculated with *S. fructicola* or *P. expansum* was retarded approximately as much by holding at 49° in 18 per cent. carbon dioxide as by storage at 34°.

In Bartlett pears inoculated with *Botrytis cinerea* decay was delayed more by the 50 and 22 per cent. carbon dioxide treatments than by storage at 32°, 10 per cent. gas treatment delaying decay longer than immediate storage at 45°.

Red raspberries cooled from 70° to 40° or 50° and exposed to 20 per cent. or more of the gas developed less than half the decay shown by fruit held at 41° and less decay than fruit placed at 32°. Gradual cooling

of blackberries in gas storage was nearly as effective as immediate storage at 32°. With dewberries the gas treatments reduced decay to about one-third of that of controls held at a similar temperature.

When tomatoes were inoculated through wounds with *Phoma destructiva* [ibid., xv, p. 781], *Fusarium* sp., and *Colletotrichum phomoides* [ibid., xii, p. 121], and held at temperatures of 50° to 77°, in 25 per cent. or more carbon dioxide, the rate of fungal growth was reduced to about half that in normal air at the same temperature, and was similar to that in normal air 5° to 10° lower. The extreme response of these organisms to temperature [see below, p. 69] coupled with the relatively slight response to carbon dioxide, however, minimizes the value of gas storage in relation to tomato decay. In cultural experiments with *Phomopsis vexans* [ibid., xiv, p. 151], *Sclerotium rolfsii*, *Rhizoctonia* [*Corticium*] *solani*, *Colletotrichum lindemuthianum*, and *Bacillus carotovorus*, the growth of the first was entirely prevented at medium concentrations of the gas, that of the next two organisms was delayed as much by gas treatments as by a 15° to 20° reduction of temperature, but the last two showed little response. Exposure to carbon dioxide markedly inhibited decay in carrots inoculated with *Rhizoctonia* sp. or *Sclerotinia sclerotiorum*, and reduced infection of asparagus sprayed with a spore suspension of *Rhizopus* by 40 per cent. as compared with the controls.

Of the citrus-rotting organisms, *Diplodia natalensis* [ibid., xv, p. 778] was inhibited least by carbon dioxide, followed in order by *P.* [*Diaporthe*] *citri*, *Penicillium digitatum*, and *P. italicum* [ibid., xv, p. 716]. At temperatures approximating to those in storage the ratio of the hours of delay to hours of treatment indicated that the activity of *Diplodia natalensis* was reduced 50 and over 60 per cent. by exposures to 35 to 40, and 50 per cent. of the gas, respectively. The reduction of *Diaporthe citri* and *P. digitatum* was probably rather more. With *P. italicum* exposure to 45 per cent. carbon dioxide gave almost complete inhibition. Exposure to 43 to 45 per cent. carbon dioxide at 77° to 79° had a checking effect approximately equivalent to drops in temperature of 8°, 13°, 23°, and 33° in the case of *Diplodia natalensis*, *Diaporthe citri*, *P. digitatum*, and *P. italicum*, respectively.

Keitt (G. W.), Pinckard (J. A.), Shaw (L.), & Riker (A. J.). **The toxicity of certain chemical agents to Erwinia amylovora.**—*J. agric. Res.*, liii, 4, pp. 307–317, 1936.

A tabulated account is given of tests of the toxicity of a number of chemical compounds and spray materials to the fireblight organism (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, xv, p. 814], by a method based chiefly on the technique of Rideal and Walker, and Anderson and McClintic, as modified by Reddish. Among the materials investigated mercury and silver compounds were by far the most toxic to the organism, suggesting the possibility of eventually adapting mercury for increased use in the control of fireblight. Mercuric cyanide was the least toxic of the mercury compounds, ethyl mercuric chloride was intermediate and mercuric chloride, mercurous chloride, and mercuric oxide were the most toxic. Bordeaux mixture and the zinc sulphate-lime spray were lethal at strengths lower than those usually

recommended for orchard use, though copper sulphate and zinc chloride alone were among the least toxic substances tested. Lime-sulphur showed little or no toxicity to the organism at the concentrations used in practice.

SCHMIDT (M.). **Venturia inaequalis (Cooke) Aderhold. V. Weitere Untersuchungen über die auf verschiedenen Bäumen lebenden Populationen des Apfelschorfpilzes.** [*Venturia inaequalis* (Cooke) Aderhold. V. Further studies on the Apple scab fungus populations inhabiting different trees.]—*Gartenbauwiss.*, x, 3, pp. 422–427, 1 diag., 1936.

Continuing his studies on physiologic specialization in the agent of apple scab (*Venturia inaequalis*) [*R.A.M.*, xv, p. 30], the writer isolated from five diseased trees a large number (90 to 97 per tree) of monospore cultures. The varieties represented were Beauty of Boskoop (3 trees), Kaiser Wilhelm, and Muscat Pippin, one of the first named being situated at a distance of some 500 m. from the others. Among the 473 isolations 448 morphologically distinct types of the fungus were distinguishable, a result that, taken in conjunction with the frequency of identical forms on different trees, is regarded as conclusive evidence against any correlation between the scab population of a given tree and local features of its habitat; there was, moreover, no necessary connexion between a given population and a particular host. It would appear, from the outcome of these experiments, that the composition of a scab population on any one tree is determined by the interplay of the environmental factors governing the development of infection and the spread of the fungus, in combination with the intense degree of polymorphism manifested by *V. inaequalis* [cf. ibid., xv, p. 513].

HERBST (W.). **Venturia pirina Aderhold. I. Zur Formenmannigfaltigkeit des Pilzes.** [*Venturia pirina* Aderhold. I. On the polymorphism of the fungus.]—*Gartenbauwiss.*, x, 3, pp. 428–450, 13 figs., 1936.

Using similar methods to those employed by Rudloff in his studies on polymorphism in *Venturia inaequalis* [see preceding abstract], the writer cultured on solid agar over 3,000 isolations of *V. pirina* from pear leaves and fruits of different varieties from widely separated parts of Germany and made detailed observations on more than 1,300.

Population analyses of *V. pirina* on 40 standard varieties (including several Butter, Schmalz [Lard], and Dechant types, Bonne Louise d'Avranches, Pastor, Boscs Flaschen, Williams's Bon Chrétien, and Forelle [Trout]) revealed, as in the case of *V. inaequalis*, a pronounced tendency to polymorphism, and a preliminary systematic classification of the various forms represented was made on the basis of cultural coloration (dark brown, mouse-grey, or olive-green) and morphology. Hyphal conformation was found to vary greatly in the different forms, 'smooth' hyphae [with cylindrical cells] being generally produced in the grey and green cultures and 'articulated' ones [with inflated cells] corresponding to the 'S' type in *V. inaequalis* in the dark brown, in which alone conidia were formed to any appreciable extent. Chlamydospores and other deviations from the normal conidial habit were of

frequent occurrence. There were no certain indications of any strict confinement of the various forms or populations to the leaves or fruit. Different forms of the fungus were found to predominate in the various localities furnishing experimental material. In certain districts varieties are attacked which in others are free from infection, and in such cases particular forms could sometimes be isolated which were seldom or never found elsewhere; possibly types of differing aggressiveness and localization were involved. Mutations of various kinds, including albino forms, presumably of nuclear origin, occurred in 16·7 per cent. of the total cultures and are considered to afford a partial explanation of the polymorphism of *V. pirina* in nature. The above-mentioned dark brown cultures, however, are believed to represent the fundamental growth habit of *V. pirina*.

The control of black spot on Pears.—*Tasm. J. Agric.*, vii, 3, pp. 110–113, 2 figs., 1936.

The results of spraying experiments in 1935–6 in a block of Winter Nelis and Beurré Bosc pears affected with black spot [scab; *Venturia pirina*: *R.A.M.*, xv, p. 588] showed that the percentage of clean fruit was raised from 0·5 in the untreated Winter Nelis and 5 in the untreated Beurré Bosc trees to 87·2 and 86 per cent., respectively, in the trees that had received the full spraying programme (six applications). The omission of the calyx spray reduced the percentage of marketable fruit to 45·8 in Winter Nelis and 79·9 in Beurré Bosc. The strong (6–4–40) Bordeaux mixture was slightly more effective than the weak (4–4–40).

Goidànich (G.). **La leptonecrosi degli alberi da frutta ed il comportamento di alcune varietà americane.** [Leptonecrosis of fruit trees and the behaviour of some American varieties.]—*Ital. agric.*, lxxiii, 6, pp. 459–464, 6 figs., 1936.

Italian fruit-growers are urged to abandon the cultivation of the American and Japanese plum varieties derived from *Prunus salicina*, e.g., Burbank, S. Rosa, Shiro, Rutland Plumcot, and Formosa, on account of their great susceptibility to leptonecrosis [*R.A.M.*, xiv, p. 800], and to substitute those belonging to *P. domestica*, on which the disease has never been observed. Leptonecrosis is prevalent in the north and north-central provinces, where apricots and cherries are also affected, though not so severely as plums.

Fish (S.). **Fungus disease control.**—*Fruit World, Melbourne*, xxxvii, 8, p. 5, 1936.

Three years' tests carried out in Victoria showed that peach blossom blight and brown rot (*Sclerotinia fructicola*) [*R.A.M.*, xv, p. 592] were significantly reduced by strict orchard sanitation (including ploughing before the first spraying), spraying with Bordeaux mixture 6–4–40 at the late dormant or early pink bud stage, and applying dry mix lime-sulphur (63 per cent. very finely divided sulphur, 30 per cent. slaked lime, and casein spreader) at the rate of 25 lb. per 100 galls. at the beginning of October, end of November and January, and middle of February. The spray deposit is washed off during the normal processing at the cannery.

Similar experiments with the very susceptible Thiele peach variety showed that rust [*Puccinia pruni-spinosae*: see above, p. 21] was reduced to a minimum by a series of dry mix lime-sulphur cover sprays as used against *S. fructicola* even under conditions strongly favouring infection.

Consistent control of pear black spot [scab; *Venturia pirina*: ibid., xv, p. 728] was given by spraying with Bordeaux mixture 6–4–40 when the young folded leaves protrude from the bud, when they have separated from the closed buds, and again (3–3–50) three weeks after fruit formation. The treatment may cause slight russeting, and should not be used on the Josephine variety.

Berkeley (G. H.). **Root rots of the Raspberry.**—*Canad. J. Res.*, xiv, 8, pp. 306–317, 4 pl., 1936.

Isolations from necrotic lesions on otherwise apparently healthy roots of raspberry plants in Ontario and British Columbia, which in some cases showed marked lack of vigour, yielded *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xiv, p. 180], *Cylindrocarpon radicicola* [ibid., xv, p. 605], *Fusarium* sp. possibly *F. orthoceras*, *Cylindrocladium* sp., *Pythium* spp., *Rhizoctonia* [*Corticium*] *solani*, and a *Rhizoctonia* of the orchid type [*R. repens*: ibid., xv, p. 449]. While the rotting of the roots may not be entirely responsible for the stunting or death of the above-ground parts, it is believed they play an important role in this connexion and in preliminary inoculation experiments each of these organisms produced necrotic lesions on healthy raspberry roots. The author considers that under certain conditions roots of the raspberry are undoubtedly subject to attack by these fungi. Roots from affected, and, in some cases, from apparently healthy, plants also showed the presence of the Phycomycetous mycorrhizal fungus, already shown to be associated with strawberry and tobacco root rot [loc. cit.]. In a few diseased roots, resting cells of *Asterocystis* were found though little or no necrosis was observed. When strawberry and raspberry seeds were sown in sterilized and non-sterilized soil the roots in the sterilized soil remained healthy, while those in the untreated soil showed necrotic lesions.

The evidence obtained showed not only that certain symptoms of raspberry root rot are similar to those of strawberry root rot [ibid., xv, p. 780] but that many of the organisms associated with strawberry root rot are also present in raspberry root rot.

Dufrénoy [J.]. **Le traitement du sol, désinfection, amendement fumure, en vue de combattre chez les plantes agricoles de grande culture les affections parasitaires et les maladies de carence.** [Soil treatment, disinfection, and an improved fertilizing scheme to combat parasitic infections and deficiency diseases in agricultural economic plants.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 679–728, 6 figs., 4 graphs, 1936.

The writer summarizes and interprets by statistical methods some outstanding contemporary researches on the relations between certain parasitic and deficiency diseases of agricultural plants and various soil defects. Cyto-chemical researches and field experiments statistically

interpreted are shown to constitute a converging technique for the study of soil treatment for the control of plant diseases.

Foëx (E.). **La lutte contre les affections parasitaires des plantes de grande culture par l'adoption de méthodes de culture (assolement et travail du sol) rationnelles.** [The campaign against the parasitic diseases of economic plants by the adoption of rational cultural methods (crop rotation and soil cultivation).]—*Annu. agric. Suisse*, xxxvii, 7, pp. 668–678, 1936.

Improved methods of crop rotation and other cultural practices based on the physical structure, chemical composition and reaction, nutritional properties, or microbiology of the soil, are discussed in relation to the control of a number of well-known plant diseases, including cereal root rots (chiefly *Ophiobolus graminis*) and lucerne sickness [*R.A.M.*, xv, p. 659], clover sickness (including *Sclerotinia trifoliorum*) [ibid., xv, p. 725], and flax sickness (*Fusarium lini*) [ibid., xv, p. 805, and above, p. 41].

Volkart [A.]. **Die Bekämpfung der Pflanzenkrankheiten durch die Züchtung immuner und resistenter Sorten.** [The control of plant diseases by the breeding of immune and resistant varieties.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 745–758, 1936.

The majority of the papers on which this résumé of contemporary studies on plant breeding for immunity from disease is based have been noticed in this *Review* from the original sources.

Eastham (J. W.). **Diseases of cultivated plants.**—*Hort. Circ. B.C.*, 73, 84 pp., 22 figs., 1936.

Brief notes are given on the symptoms and control of the chief fungal, bacterial, and physiological diseases of cultivated plants in British Columbia, together with a short article by B. Hoy on sprays and spraying.

Stakman (E. C.). **The problem of specialization and variation in phytopathogenic fungi.**—*Genetica*, xviii, 3–4, pp. 372–389, 1936.

This lecture, delivered at the International Botanical Congress, Amsterdam, 1935, is a critical discussion, illustrated by references to outstanding contemporary researches [most of which have been summarized in this *Review*], of some important aspects of the specialization, variation, and hybridization of fungi pathogenic to plants.

Feiginson (N.). Выяснение видового состава поражаемых культур, географического распространения и вредоносности вирусных болезней растений. [Determination of the crops susceptible to virus diseases; geographical distribution and injuriousness of virus diseases of plants.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 505–507, 1936.

Careful searches in 1934 in all the cotton-growing areas of the U.S.S.R. showed that Azerbaidjan [Baku] province is the only region where cotton leaf curl [*R.A.M.*, xiv, p. 757] attained any degree of economic importance, the American long fibre varieties being apparently the most susceptible to this trouble. 'Stolbur' [ibid., xv, p. 754]

is stated to be very prevalent on tobacco, tomato, and chilli [*Capsicum annuum*] not only in the Crimea but also in the Moldavian S.S.R., on the Azoff-Black Sea littoral, in Armenia, and in the Stalingrad and Saratoff reaches of the Volga basin, where it causes very considerable annual losses, especially to the fruit-preserving industry. Tomato mosaic occurs wherever the crop is grown, but it causes serious damage only when infection of the transplants takes place very early in the season. Among the virus diseases of the potato rugose mosaic [ibid., xiv, p. 116; xv, p. 459, et passim] is stated to be the most widespread and to cause the largest losses, especially in southern regions. Other crops mentioned as suffering considerable losses from virus diseases are legumes, especially French beans [*Phaseolus vulgaris*], currants, and raspberries.

MELIN (E.). **Methoden der experimentellen Untersuchung mykotropher Pflanzen.** [Methods for the experimental investigation of mycotrophic plants.]—*Handb. biol. ArbMeth.*, xi, 4, pp. 1015–1108, 21 figs., 3 diags., 1936.

In this valuable treatise the writer fully describes the methods employed by himself and other workers in experimental studies on mycorrhiza. A seven-page bibliography is appended.

SEMPIO (C.). **Influenza di varie sostanze sul parassitamento: ruggine del Fagiolo, ruggine e mal bianco del Frumento.** [The influence of various substances on parasitism: Bean rust, Wheat rust and mildew.]—*Riv. Pat. veg.*, xxvi, 7–8, pp. 201–278, 6 figs., 16 graphs, 1936.

A detailed account is given of a comprehensive series of experiments in which seedlings of Giallo cinquantino precoce and Sorpassa Imperatore beans (*Phaseolus vulgaris*) and Gentil rosso and Rieti wheat were grown in a nutrient solution, to which were added known quantities of a large number of organic and inorganic substances, and then inoculated by spraying with a spore suspension of *Uromyces appendiculatus* in the case of the beans, and *Puccinia triticina* and *Erysiphe graminis* in that of the wheat. Parallel controls were similarly inoculated.

With beans, caffeine and theobromine (0·1 and 0·15 per mille, respectively) increased resistance to *U. appendiculatus*, while strychnine and codeine (0·15 to 0·2 per mille) had slightly less effect. Cadmium and nickel in solutions of M/10,000 increased resistance, but appeared to be toxic to the plants. Pyridine markedly reduced infection, but had a very adverse effect on the seedlings.

With wheat, strychnine 0·3 per mille and nickel in solution M/7,500 markedly reduced rust infection, apparently as a result of their direct effect on the fungus, but caffeine, theobromine, and codeine were without effect. On the mildew cadmium in solution M/8,000 to 10,000 had a distinctly adverse effect, apparently due to stimulation of the defensive reactions of the host. Wheat seedlings inoculated with both diseases and grown in nutrient containing cadmium M/7,500 developed only the rust, while others, similarly inoculated, and given strychnine 0·22 per mille, developed only the mildew, infection being abundant in each case.

Amygdalin, arbutin, ethyl alcohol, vaccines prepared from diseased plants, and, to a lesser degree, other substances had a depressive effect

on both the bean [*R.A.M.*, xii, p. 45] and wheat seedlings, which became severely infected by the respective diseases. On the other hand a number of substances, including certain hormones (with beans only), exerted no influence on susceptibility.

SEMPIO (C.). **Relazione tra il pH dei substrati culturali e l'azione a distanza del piombo.** [The relation between the P_H value of culture media and the action of lead at a distance.]—*Riv. Pat. veg.*, xxvi, 7–8, pp. 279–297, 5 figs., 6 graphs, 1936.

When the conidia of *Thielaviopsis basicola* in hanging drop cultures were exposed to the action of lead at a distance [*R.A.M.*, xiv, p. 647], the reduction in germination was progressively more marked with the following media: (1) apple, tobacco, and cabbage extracts, (2) honey in water, 1 in 9, and carrot extract, (3) beet, turnip, fennel, bean, and potato extracts, (4) spinach and onion extracts, and (5) malt, wort, and meat extracts. Lead also inhibited germination in numerous other nutrients tested. The P_H values of the media in which exposure to lead had the most marked effect (solution A, comprising inorganic compounds plus small amounts of saccharose and asparagin, which gave the best growth, and meat broth) were, respectively, 7·1 and 5·9, the corresponding figures for cabbage and apple extracts, in which exposure had less effect, being 5·04 and 4·02, respectively. When the P_H values of the meat broth and solution A were adjusted to between 4·4 and 4·8 and 4·5 and 5, respectively, by the addition of tartaric acid the depressive effect of the lead on germination appreciably diminished. In the controls, using solution A and meat broth, fungal growth was about the same, whether the media were neutral or acid. Rather more marked results followed when citric and malic acid were used instead of tartaric acid.

Repeat experiments with *Aspergillus niger*, *Penicillium crustaceum*, and *Trichothecium roseum* gave results similar to, but less marked than, those obtained with *Thielaviopsis basicola*. With all four fungi grown in solution A, or malt, apple, or cabbage extracts, the effect of exposure to the lead was most reduced in media with the P_H value lying between 4 and 5·5.

It is concluded that the P_H value of the media markedly increases or reduces the depressive effect on germination of lead exposed at a distance to fungi susceptible to such effect.

GÄUMANN (E.). **Quelques problèmes d'immunité.** [Some problems of immunity.]—*Annu. agric. Suisse*, xxxvii, 7, pp. 729–744, 1 fig., 6 graphs, 1936.

The writer's discussion of various problems involved in the immunity of plants from certain fungal and bacterial diseases has already been summarized from another source [*R.A.M.*, xv, p. 675].

GHEORGHIU (I.). **Étude sur l'immunité chez les plantes.** [A study on immunity in plants.]—*Ann. Inst. Pasteur*, lvii, 2, pp. 204–212, 4 figs., 1936.

By means of injection with a vaccine prepared from autoclaved emulsions, mixed with 2 per cent. formol, of a *Sclerotinia* causing a severe

wilt disease of *Pelargonium zonale*, the writer succeeded in producing temporary immunity (for six to eight months) from infection. A few of the test plants displayed symptoms of intolerance analogous to those observed in animals imbibing an excess of the antigenic principle, but this phenomenon was not of long duration. A microscopic examination of the treated plants revealed the fungus, still in a viable condition, in the leaf tissues, so that the temporary recovery must be due, not to the elimination of the pathogen but either to its loss of toxin-producing capacity or else to the neutralization of the infective principle by the antitoxin secreted by the host as a sequel to vaccination. Antibodies could not be detected in the treated plants, and the actual mechanism of the development of immunity is consequently not fully understood.

KLAPP (E.), MORGENWECK (G.), & SPENNEMAN (F.). **Ueber den Einfluss des Standortes auf Ertrag und Pflanzwert der Kartoffel. Untersuchungen über 21 fünfjährige Nachbaureihen.** [On the influence of the locality on yield and seed value of the Potato. Investigations on 21 five-year progeny series.]—*Landw. Jb.*, lxxxiii, 2, pp. 153–207, 3 graphs, 1936.

In this very comprehensive, fully tabulated account of investigations conducted from 1930 to 1934, inclusive, in 28 localities of Thuringia on the correlation between ecological factors and the yield and health of Parnassia and Erdgold potatoes [*R.A.M.*, xv, p. 247], the writers state that the 21 lots of progeny of the former variety, the original stock of which was relatively free from virus diseases, showed no appreciable falling-off (degeneration) [see next abstracts] during the period covered by the tests, whereas by the fourth year the yields of Erdgold, infected by mosaic and other viruses from the outset, had declined on an average by 30 per cent. In the case of Parnassia the increase of virus diseases was correlated with an extended use of stable manure and synthetic fertilizers in general, as well as with cultivation in low-lying localities, whereas foot rots (comprising various forms of *Rhizoctonia* [*Corticium solani*], blackleg [*Bacillus phytophthorus*], and miscellaneous pathological conditions) were more prevalent in elevated situations and where the supply of phosphates was deficient. Virus infections in Erdgold were most in evidence in sticky, abundantly manured, neutral to alkaline, very prolific soils. In general, the maximum seed value is to be anticipated from crops cultivated in localities intermediate between mountainous regions and those of intensive cultivation, supplied with moderate amounts of nitrogen, and originating from low- to medium-yielding stocks with a low incidence of virus infections and a slight to moderate tendency to other diseases; extremes, in other words, are to be avoided. The conclusion already reached at an earlier stage in these studies, namely, that virus diseases are only one of the factors in the degeneration complex [loc. cit.], is fully substantiated by these supplementary observations.

KLAPP [E.]. **Abbau und Abbaubekämpfung im Pflanzkartoffelbau.** [Degeneration and degeneration control in seed Potato cultivation.] —*Mitt. landw., Berl.*, li, 32, pp. 692–694, 1936.

Following an introductory note on the complex phenomenon of

potato degeneration in Germany [see preceding and next abstracts], the writer sums up the ecological, hereditary, and cultural factors determining the extent and progress of the disturbances grouped under this head, and offers some practical recommendations for arresting the spread of deterioration [cf. *R.A.M.*, xv, pp. 524, 597–599]. These include the selection of isolated sites for seed potato cultivation; drastic and repeated roguing of suspected plants; separate storage of the seed-potato crop; strict attention to cultural practices, avoiding late spring ploughing, premature planting in damp, cold soils, and unduly wide spacing (there should not be less than five plants per sq. m.); the adoption of a rational manuring scheme (sparing nitrogen, liberal phosphate supply); timely harvesting, and great care in the various operations following lifting, and in storage accommodation.

Opitz. **Zur Frage der Virus-Übertragung in Kartoffelfeldern.** [On the question of virus transmission in Potato fields.]—*Dtsch. landw. Pr.*, lxiii, 32, pp. 399–400, 1936.

A series of parallel experiments is in progress at Berlin-Dahlem and Bornim in connexion with a study of virus transmission in relation to potato degeneration [see preceding abstracts], the results of which clearly demonstrate the infectious character of the viruses and the necessity for their rigid exclusion from the field by careful seed selection, drastic roguing during the growing period, and planting in isolated sites, especially in regions where degeneration is prevalent. In one test the 1935 yields of Gisevius and Erdgold seed raised in 1934 in (*a*) healthy and (*b*) diseased surroundings were 221·2 and 197·9 and 78·8 and 125·5 q. per hect., respectively. Some of the varieties officially recognized by the Reich Food Board, e.g., Gold Standard, have been found to be prone to degeneration, while the rejected Feuergold is highly resistant to disorders of this type, as also is the authorized Ackersegen.

Gratia (A.) & Manil (P.). **Virus des plantes et hérédité.** [Plant viruses and heredity.]—*C.R. Soc. Biol., Paris*, cxxii, 22, pp. 814–815, 1936.

The writers were supplied by Prof. Quanjer with tubers and seed of the potato variety Jaune d'Or, a carrier of mosaic [virus X: *R.A.M.*, xiv, p. 327; xv, pp. 680, 738]. The plants raised from both sources presented an identical and entirely normal aspect, but the juice of those originating from the tubers was actively flocculated by the anti-X serum and produced in the *Datura* plants into which it was inoculated the characteristic X virus symptoms. On the other hand, the juice of the plants derived from seed was non-infectious and was not flocculated by the anti-X serum. These results are considered to furnish conclusive evidence against the hereditary theory of virus perpetuation [see next abstract].

Gratia (A.) & Manil (P.). **Perte et récupération de la propriété 'carrier' de virus X chez la Pomme de terre.** [The loss and recovery of the 'carrier' property of virus X in the Potato.]—*C.R. Soc. Biol., Paris*, cxxii, 27, pp. 325–326, 1936.

Jaune d'Or potato seedlings raised from seed and devoid of virus X [see preceding abstract] were inoculated with the virus from

a parallel series of plants derived from tubers and subjected a fortnight later to serological tests, the outcome of which indicated that they were in possession of the infective principle, lost through sexual reproduction.

RALEIGH (W. P.). **An abnormal graft reaction in Potato resulting from a virus infection of a scion on a resistant stock.**—*Phytopathology*, xxvi, 8, p. 795, 1 fig. (on p. 796), 1936.

In the course of studies on the resistance of potatoes to virus diseases [(?) in Maine], Green Mountain scions infected with latent mosaic (X virus) [*R.A.M.*, xiii, p. 465 and preceding abstracts] developed aerial tubers, leaf roll, and marked stunting when grafted on healthy U.S.D.A. seedling 41956, known to be resistant to this disease. Green Mountain seedlings without latent mosaic, grafted on healthy 41956, did not develop the above-mentioned abnormalities, but Green Mountain seedlings infected with latent mosaic reacted like Green Mountain. A similar abnormal reaction was observed on grafts of scions infected by mild mosaic on stocks of the ordinarily fairly resistant Irish Cobbler variety. So far, 41956 has not been systemically infected by latent mosaic to the extent of perpetuating it through the tubers, but it has developed a very slight, sometimes barely perceptible, foliar spotting when grafted on a latent mosaic plant. The general principle of grafting infected scions on potatoes to determine their reaction to a particular virus is believed to offer considerable promise of utility in resistance studies.

BAWDEN (F. C.). **The viruses causing top necrosis (acronecrosis) of the Potato.**—*Ann. appl. Biol.*, xxiii, 3, pp. 487–497, 1936.

The results of investigations discussed in this paper show that top necrosis, although it is rarely seen in the field, can be induced in different potato varieties by the potato viruses A, B, C, D, and X [*R.A.M.*, xiv, p. 523; xv, p. 738]. By inoculating the four varieties Up-to-Date, Epicure, President, and Arran Victory either by grafting or needle inoculation with sap from infected potatoes it has been possible to distinguish the six viruses studied with a fair degree of accuracy, in that top necrosis was induced on Up-to-Date by viruses A, C, and D, on Epicure by B, C, D, and X, on President by B and C, and on Arran Victory only by B; virus Y induced acropetal necrosis on Up-to-Date and President, and foliar necrosis was induced by virus D on President and Arran Victory.

MÜLLER (K. O.). **Die Variabilität der Virulenz und der biologischen Spezialisation bei dem Erreger der Kartoffelkrautfäule, Phytophthora infestans.** [The variability of virulence and biologic specialization in the agent of Potato late blight, *Phytophthora infestans*.]—*Naturwissenschaften*, xxiv, 35, pp. 552–557, 1 map, 1936.

In addition to information already presented in this *Review* from other sources, the writer discusses some further problems arising out of his studies on biologic specialization in *Phytophthora infestans* on potato [*R.A.M.*, xv, p. 600]. It appears from the behaviour of a monosporangial culture of the S type under observation since 1932 (148

generations) that a gradual loss of vitality is the result of transference from the preferred W varieties to some only moderately congenial commercial potatoes; the same monosporangial line on W material maintained its original virulence down to the 146th generation. The loss of vitality was expressed primarily by an impairment of the reproductive faculty and in a secondary degree by protraction of the incubation period and retardation of mycelial growth. A slow recovery of the damaged strains could sometimes be effected by reinoculating them, preferably by means of zoospore suspensions, on to W material. These laboratory results are stated to have been confirmed by field observations on the variations in virulence and vitality of 14 A strains isolated in Silesia and Grenzmark.

It is apparent from these investigations that the host plays by no means only a passive part in its relationship with the late blight pathogen, the fate of which it influences, indeed, in two directions. On the one hand the large-scale cultivation of varieties resistant to a widespread strain of the fungus may involve a complete redistribution of the pathogenic population, while on the other a persistent decline of virulence may accompany the encounter of the parasite with a host to which it is not particularly well adapted.

STEVENSON (F. J.), SCHULTZ (E. S.), CLARK (C. F.), RALEIGH (W. P.), CASH (LILLIAN C.), & BONDE (R.). **Breeding for resistance to late blight in the Potato.**—*Amer. Potato J.*, xiii, 8, pp. 205–218, 1936.

Under Maine conditions the most promising of the potato varieties resistant to late blight (*Phytophthora infestans*) [see preceding abstract] introduced into the United States, where the ten-year (1925 to 1936) average yield reduction from this cause is estimated at over 9,000,000 bushels, is Foster's Rust Proof or No Blight, but this variety is not widely cultivated. Selections resistant to the disease have been obtained at Presque Isle, Maine, by selfing a susceptible variety (Katahdin), crossing two resistant ones (S45349 and Ekishirazu and No Blight and Ekishirazu), crossing a resistant variety (No Blight) with a susceptible one (Katahdin), the latter probably carrying two heterozygous factors for resistance, and crossing two susceptible varieties (Chippewa and Katahdin). A selection of the last cross was only slightly injured by the late blight epidemic of 1932 in an unsprayed plot, in which the checks were killed, and for four years it has been equally resistant with No Blight and more so than Green Mountain, outyielding the former by 95 bushels of primes per acre (average of three years). Progenies related to the so-called W races of Germany showed a high degree of resistance, while Ackersegen is comparable to No Blight in its reaction.

VOLKART (A.). **Die Krautfäuleanfälligkeit der Sorten des Kartoffelrichtsortimentes.** [The susceptibility to late blight of the varieties of the standard Potato assortment.]—*Schweiz. landw. Z. 'Die Grüne', 1936*, 35, p. 2, 1936.

Late blight of potatoes (*Phytophthora*) [*infestans*: see preceding abstracts], epidemics of which in Switzerland appear to recur at 20-year intervals, was greatly favoured by the damp summer conditions of 1936. Observations in three localities on the reaction to the disease

of the 21 varieties comprising the standard potato assortment showed that Ackersegen and Voran (both late) are highly resistant, while a satisfactory degree of vigour was further maintained by a number of others, including Alma (medium-early), Centifolia, Jubel, Stärkereiche [Starchy] I, and Wohltmann (all late) [cf. *R.A.M.*, xiv, pp. 390, 606; xv, p. 393, *et passim*].

FINDLAY (D. H.) & SYKES (E. T.). **Destruction of Potato haulm to prevent blight infection of the tubers.**—*J. Minist. Agric.*, xliii, 5, pp. 457–459, 1936.

In a comparative test carried out on 21st September, 1935, at Terrington St. Clement [Norfolk], on the use of 12½ per cent. (by volume) sulphuric acid (brown oil of vitriol) and 5 per cent. copper sulphate solution at the rate of 100 galls. per acre, for the destruction of green potato haulms against blight [*Phytophthora infestans*: *R.A.M.*, xiv, p. 789; xv, pp. 458, 556], the percentage of infected tubers was reduced from 13·8 in the control to 4·7 and 4, by the two treatments, respectively, the contract costs of which were 17*s.* 6*d.* and 15*s.* per acre. The yield of ware tubers was increased from 9·2 to 11·0 and 11·4 tons per acre, respectively. Copper sulphate was, therefore, as effective as sulphuric acid and besides being somewhat cheaper is more convenient to use. In a further test, a finely divided copper sulphate dust mixed with a spreader and applied from a blower at the rate of 30 lb. per acre destroyed the haulms rather more effectively than the 5 per cent. copper sulphate solution.

O'BRIEN (D. G.) & DENNIS (R. W. G.). **The place of boron in Potato cultivation.**—Reprinted from *Scot. Fmr*, 4 pp., 3 figs., 1936.

Investigations carried out in Scotland on the relation of boron to non-parasitic leaf roll [cf. *R.A.M.*, xv, p. 253], pseudo-net necrosis [ibid., xiv, p. 253; xv, p. 460], and internal rust spot [cf. ibid., xv, p. 249 and below, p. 58] of potatoes indicated that the first-named is characteristic of certain soils and varieties (Gladstone, Catriona, and Di Vernon being susceptible), is most conspicuous in dry seasons, and shows reduced intensity when drought is followed by heavy rain. When borax was applied to two plots (each ⅓ acre in extent) of Gladstone potatoes at the rates of 10 and 20 lb. per acre before planting on 26th April, the shoots emerged much more quickly than in the untreated control plot. On 26th June the treated plots were still noticeably superior to the control, on which leaf roll symptoms were beginning to appear though none occurred throughout the season on the others. When the crop was lifted, the yields per acre amounted to 11 tons 11 cwt. and 10 tons 6 cwt. for the plots given the heavy and light application of borax, respectively, as against 8 tons 11 cwt. in the control, the treatments thus giving increases in yield of 35 and 19 per cent., respectively. It is evident that with susceptible varieties borax applications at rates up to 20 lb. per acre may prove highly beneficial in suppressing the disease and increasing yield. The borax should be mixed with some active material and spread evenly over the field before the drills are drawn. Potatoes are highly susceptible to the toxic effects of excess boron, and the dressing should never be made in the drill.

The experimental evidence obtained demonstrated conclusively that boron deficiency was unrelated to pseudo-net necrosis in Golden Wonder potatoes.

Examination at the end of January of stored Golden Wonder potatoes grown in two plots, one untreated, the other dressed with borax at the rate of 15 lb. per acre, showed 0 and 21 per cent. internal rust spot for the treated and untreated plots, respectively. Further experiments are planned in which it is hoped to secure heavier infection in the controls.

WHEELER (E. J.). **Inoculation of Potato seedlings with the yellow dwarf virus.**—*Amer. Potato J.*, xiii, 8, pp. 220–222, 1936.

Yellow dwarf [*R.A.M.*, xv, p. 249] was found to be transmissible from diseased to healthy potatoes by means of plug-grafting, and it is hoped that this method may prove useful in Michigan in breeding for resistance to the trouble. Several seedlings failed to contract the disease either from exposure to heavy field infection or as a result of artificial inoculation.

EASTHAM (J. W.). **Potato diseases.**—*Field Crop Circ. B.C.* 15, 34 pp., 25 figs., 1936.

Brief, popular notes are given on the fungal, virus, and physiological diseases of potatoes with special reference to symptoms and control.

FERDINANDSEN (C.). **Kartoffelbrok og Kartoffelaal.** [Potato wart and Potato eelworm.]—*Ugeskr. Landm., 1936*, pp. 617–621, 2 figs., 1 diag., 1 map, 1936.

The writer summarizes in semi-popular terms the essential information on the life-history and mode of dissemination of potato wart (*Synchytrium endobioticum*), and discusses the distribution of the disease in Denmark [*R.A.M.*, xiv, pp. 741, 788] and the legislative measures [ibid., xiv, p. 544] adopted to stem its advance. So far these have met with only limited success, the number of administrative areas affected at the beginning of 1935 being no less than 117. The export of potatoes from these areas is prohibited, and owners of infected land were supplied by the quarantine authorities with sufficient stocks of the immune Ebstorf Juli Perle and Majestic for use in 1936 and subsequent propagation. Further trials of immune varieties are to be undertaken.

GOSS (R. W.). **Fusarium wilts of Potato, their differentiation and the effect of environment upon their occurrence.**—*Amer. Potato J.*, xiii, 7, pp. 171–180, 1936.

Fifteen years' observations in western Nebraska are stated to have shown that, in general, the wilt of Bliss Triumph potatoes caused by *Fusarium oxysporum* [*R.A.M.*, xv, p. 680] is present in small amounts in the majority of fields, whereas that due to *F. solani* var. *eumartii* [ibid., x, p. 13; xiv, p. 334] is less widespread but affects a higher percentage (up to 50) of the plants. The former type, appearing in July and early August, is usually characterized by chlorosis of the basal leaves, followed by rapid wilting of the whole plant or of individual stalks in a hill. The invasion of the stem results from seed-piece decay through soil infection [ibid., v, p. 383]. The latter form of wilt, occurring in

late August and early September, first develops as an interveinal chlorosis and partial necrosis of the youngest leaves. In damp, cool weather the further spread of the disease may be arrested, but a hot, dry spell following infection is liable to cause the premature death of the plants. *F. solani* var. *eumartii* commonly enters through the roots and does not reach the underground stem until the final stages of the disease, when the vascular system shows a deep brown discoloration extending above soil-level and a brown flecking of the pith, particularly at the nodes. The seed piece is also discoloured, the root hairs destroyed, and the root cortex sloughed off. An extensive stem-end rot of new tubers in the field is also frequently caused by *F. solani* var. *eumartii*, another feature of which is a vascular discoloration, with light brown, water-soaked margins, sometimes extending throughout the tuber, which may also show deep black streaks or other variations of the discoloration [ibid., iv, p. 114]. Another form of infection by this fungus occurs through the seed piece and affects the underground stem in the manner described for *F. oxysporum*, from which the wilt may be distinguished in the early stages, however, by the interveinal chlorosis peculiar to *F. solani* var. *eumartii*. In the presence of excessive soil moisture either of these two wilts may induce a reddish or purple upward rolling of the margins and the formation of aerial tubers or shoots in the leaf axils, giving the rosetted aspect associated with stem-girdling by *Rhizoctonia* [*Corticium solani*].

F. oxysporum thrives at high temperatures, the optima for its growth in pure culture and in the soil being 25° to 30° C. and 30°, respectively; in the fields, however, infection may occur at a temperature as low as 14° [ibid., ii, p. 521]. *F. solani* var. *eumartii*, on the other hand, grows better in a relatively cool atmosphere, its optima for development in pure culture and in the soil being 25° and 20° to 25°, respectively, with a maximum at 30°. During the six years from 1930 to 1935, inclusive, the highest percentage (17·9) of *Fusarium* wilt (probably due in the main to *F. solani* var. *eumartii*) at an experimental farm at Alliance occurred in 1932, the coolest season with the heaviest rainfall. In four years' experiments comprising plots planted at 7- to 10-day intervals from the last week in May to the first in July, the average percentages of plants showing field symptoms for the five planting dates were 21·9, 10·4, 5·6, 3·9, and 0·6, respectively, the corresponding figures for tuber infection being 17·3, 16·7, 7·8, 2·5, and 1·6, respectively. The use of infected seed was experimentally shown to result in poor stands, wilted plants, and diseased tubers, and in this connexion the greater susceptibility of Cobbler as compared with Bliss Triumph was again demonstrated.

CUNNINGHAM (H. S.). **Yellow oxide of mercury treatment for seed Potatoes on Long Island.**—*Bull. N.Y. St. agric. Exp. Sta.* 668, 14 pp., 1936.

Treatment of Irish Cobbler and Green Mountain potato seed pieces and whole tubers with yellow oxide of mercury (1 lb. per 15 galls.) [*R.A.M.*, xiv, p. 150; xv, p. 602] against seed-piece decay and *Rhizoctonia* [*Corticium solani*] delayed emergence. The ultimate growth of the Irish Cobbler plants, however, was unaffected, though the Green

Mountain plants tended to be smaller as a result of the treatment. In the only instance when seed-piece decay occurred, Irish Cobblers treated immediately after cutting (4 weeks before planting) showed an ultimate stand of 89 per cent., as against 11 per cent. for the untreated controls.

While the tubers grown on Long Island (where the experiments were conducted) are not ordinarily affected by *C. solani* [ibid., xv, p. 781], stem lesions are common, and in certain soils and seasons infection may delay emergence or adversely affect the stand. Such injury is generally regarded as due to seed-piece infection, though severe damage is often due to soil infection alone. The experimental data obtained showed that the treatment reduced the percentage of stem infections even when the organism was soil-borne, and that the danger of stem infection from the soil may be greater than from diseased seed pieces.

Significant increases in yield were given by the treatment of uncut tubers of the Irish Cobbler variety, but not those of Green Mountain. Treatment of the seed pieces at the time of cutting generally reduced the yields.

BERKNER (F.) **Die Wirkung einer physiologisch sauren bzw. alkalischen Düngung auf Ertrag, Schorfbefall und Eisenfleckigkeit von drei genetisch und ökologisch verschieden eingestellten Kartoffelsorten.** [The effect of a physiologically acid or alkaline fertilizer, respectively, on the yield, scab incidence, and 'Eisenfleckigkeit' of three Potato varieties of distinct genetic and ecologic disposition.]—*Z. PflErnähr. Düng.*, A, xlv, 3–4, pp. 205–215, 1936.

A tabulated account is given of the writer's experiments at Breslau to determine the effect of a physiologically acid fertilizer (ammonium sulphate, superphosphate, and potassium sulphate) as compared with a physiologically alkaline one (calcium nitrate, basic slag, and 40 per cent. potash salt) on the incidence of scab [*Actinomyces scabies*: *R.A.M.*, xv, p. 603] and 'Eisenfleckigkeit' [? internal rust spot: see above, p. 55] in three potato varieties, Jubel (scab-resistant, susceptible to 'Eisenfleckigkeit'), Böhms allerfrüheste Gelbe (susceptible to scab), and Zwickauer Frühe (of intermediate reaction to scab). The results were strongly in favour of the acid fertilizer, both from the standpoint of yields (which were increased by 14 per cent.) and from that of scab control.

The data regarding the influence of these fertilizer combinations on 'Eisenfleckigkeit' are not clear-cut, but there is some indication that the symptoms may be alleviated by a supplementary application of lime to acid-treated plots.

CLARK (C. F.), RALEIGH (W. P.), & STEVENSON (F. J.). **Breeding for resistance to common scab in the Potato.**—*Amer. Potato J.*, xiii, 9, pp. 256–259, 1936.

Five out of 34 potato varieties tested during 1935 at Presque Isle, Maine, for their reaction to scab [*Actinomyces scabies*: *R.A.M.*, xv, p. 739] developed less than 1 per cent. as much infection as the susceptible Green Mountain check, while in nine the incidence of the disease was as high as in the control. The highly resistant varieties were Hindenburg, Richter's Jubel, Ackersegen, Arnica, and Hindenburg×

Centifolia No. 9, while relatively low percentages of scab were also shown by Dauerragis, Russet Rural, Hindenburg×Centifolia No. 15, Ekishirazu, and Russet Burbank (1, 1, 1·4, 2, and 3, respectively). Of 90 South American varieties collected in Chile, 58 were found equally prone to scab with Green Mountain, while many of the remaining comparatively resistant sorts produced crops inadequate for infection data.

Tests of seedling progenies were made from 1933 to 1935, inclusive. The material tested in 1933 consisted of a first-year seedling progeny derived from a cross between the susceptible Columbia Russet and Katahdin varieties. All the tubers (white) produced by the 392 seedlings proved susceptible. In 1934 and 1935 trials were conducted with Mahr's Russets×44537, 44537×Katahdin, 44537×45075, and 44537 inbred. Many of the seedlings of these four progenies were too poorly developed to yield conclusive data, but a number of both russet- and white-skinned segregates gave promising indications for further testing.

Naoumoff (N. A.). Разработка систематики вредоносных фикомицетов, в частности возбудителя порошистой парши Картофеля. [Systematic studies of injurious Phycomycetes, with particular reference to the causal agent of powdery scab of Potato.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 520–523, 1936.

The bulk of this paper is given to a progress report on studies started in 1935 of the biology and pathogenicity of *Spongospora subterranea* [*R.A.M.*, xv, p. 400], a disease of the potato little known in the U.S.S.R. While the infective power of the organism did not appear to be very considerable, infections resulted more freely in all the varieties tested in soils with 60 to 90 per cent. moisture content and with P_H values from 4·7 to 5·9, than in soils with 40 per cent. moisture and higher P_H values. All attempts to induce spores of *S. subterranea* to germinate in the laboratory failed. The potato varieties Pirola, Jubel, Parnassia, Rubia, and Svitez were relatively resistant to powdery scab, Rose of Milet alone appearing to be immune in 1935. The paper terminates with a key based on macroscopic symptoms of all the known diseases of potato tubers.

Roth (H.). **Die Dürrfleckenkrankheit (Alternaria solani) bei Kartoffeln.** [The dry spot disease (*Alternaria solani*) of Potatoes.]—*Dtsch. landw. Pr.*, lxiii, 24, pp. 303–304, 1936.

On the basis of information supplied by A. Aertssen of the Belgian Farmers' Union the author reviews the present position regarding early blight of potatoes (*Alternaria solani*) [*R.A.M.*, xv, p. 394] in Belgium, where it has been very severe during the past two years. Infection generally reaches a climax when the foliage of the early varieties, such as Erstling [Duke of York] and Gelderland Mouse, attains maturity; it is favoured by warm, dry conditions (optimum temperature 26° to 28° C., maximum about 45°) alternating with humid weather. The disease is liable to attack tubers during storage in ill-ventilated cellars or pits at a temperature of 13° to 16°. Control measures should include seed disinfection, summer applications of a standard fungicide, and (where practicable) the eradication during the growing season of all infected plants.

SHARPLES (A.). **Diseases and pests of the Rubber tree.**—xv+480 pp., 4 col. pl., 107 figs., 3 graphs, 3 maps, London, Macmillan & Co., 1936. Price 25*s.*

In this comprehensive and finely illustrated volume, the author deals in turn with the structure, reproduction, and physiology of fungi in general, plant form and function, root diseases, infections of the tapping panel, stem diseases, leaf diseases, various minor troubles including scorching, the treatment of rubber diseases, and the adoption of forestry methods of cultivation. A notable feature of the work is the author's treatment of root diseases (133 pp.) which have recently attained such importance in Malaya and to the elucidation of which he has so largely contributed. In an appendix, a list is given of the fungi so far recorded on rubber in Malaya. A practical outlook on the problems dealt with is maintained throughout the work, which will consequently appeal not only to the plant pathologist but also to the rubber planter.

BEELEY (F.) **Annual Report. Pathological Division.**—*Rep. Rubb. Res. Inst. Malaya, 1935*, pp. 101–116, 3 pl., 1936.

In areas of young *Hevea* rubber in Malaya the eradication of the root parasites *Fomes lignosus*, *F. noxius*, and *Ganoderma pseudoferreum* [*R.A.M.*, xiii, p. 726; xv, p. 345] is simple and economical, the inspection of all two-year-old trees indicating the diseased patches while still small and enabling the source of infection in jungle timber to be traced and removed. In this way *F. lignosus* should be completely eradicated by the fourth or fifth year and *G. pseudoferreum* and *F. noxius* a few years later. In old rubber the vacant spaces caused by *G. pseudoferreum* are often so large that the best plan is to leave the area alone until all buried roots and timber can be removed and replanting effected with contour terracing. In rubber of medium age the diseased patches should be isolated by trenches, and the infected jungle timber removed if feasible, the saving of the diseased trees by root amputation being practicable provided infection has not passed into the bole. In young rubber the presence of infected areas is indicated on the susceptible natural forest or leguminous bush covers, and this permits eradication to be promptly undertaken. When replanting the soil should be dug over, and all buried rubber roots and undecomposed jungle timber removed. This is very important in peat lands, where *F. lignosus* is prevalent and spreads rapidly along the inter-grafted mesh of lateral roots.

Ustulina zonata [ibid., xv, pp. 471, 632] frequently attacks the collar of rubber trees owing to the accumulation of putrefactive scrap rubber at the soil surface; infection is often confused with root disease, and accounts for more depletion of stand than is generally appreciated.

Wet weather in 1935 caused a considerable increase in white fan blight (*Marasmius*) [? *palmivorus*: ibid., xiii, p. 726]; the fungus is an extremely weak parasite and quickly responds to treatment with a 5 to 10 per cent. solution of tar acid emulsion.

A new bark canker on 5-year-old budded and 6-year-old seedling trees is attributed to physiological disturbance in the bark. It appears on the stem and branches as vertical cracks over a circular patch from

which a little latex may flow. A similar condition is reported from Sumatra.

The appearance of *Corticium salmonicolor* on bush covers, such as *Crotalaria* sp., caused considerable alarm, but can be avoided by giving the rubber sufficient air.

Beeley (F.). **Oidium heveae. Report on the 1936 outbreak of Hevea leaf mildew.**—*J. Rubb. Res. Inst. Malaya*, vii, 1, pp. 20–26, 1 graph, 1936.

Heavy rains followed by drought caused severe wintering and rapid refoliation of *Hevea* rubber in Malaya in 1936, with the result that in many districts the new foliage was already well developed before weather favouring *Oidium heveae* [*R.A.M.*, xv, p. 115] arrived in mid-March. The central States were again those where mildew activity was greatest, but infection was everywhere less severe than for some years. Under these conditions sulphur dusting gave no marked improvement in foliage or yield. *Helminthosporium heveae* [ibid., xii, p. 425] damaged young rubber trees in some districts.

Zattler (F.). **Neuere Untersuchungen über die Nährstoffaufnahme des Hopfens (Ernährungsphysiologie, Wasserhaushalt, Anfälligkeit).** [Recent investigations on food assimilation by Hops (nutritional physiology, water economy, susceptibility).]—Reprinted from *Allg. Brau.-u. HopfZtg, 1936*, 131, 19 pp., 1936.

In the course of his studies in Bavaria on the nutritional requirements of hops, the writer has recorded the effect of various fertilizers on the incidence of downy mildew (*Pseudoperonospora humuli*) [*R.A.M.*, xii, pp. 578, 722; xv, p. 824]. It was found that deficiency in either potassium, phosphorus, or nitrogen increased susceptibility. Excess of potash or phosphoric acid alone induced resistance while excess of nitrogen or lime had the opposite effect. It is thought that an abundance of potash is necessary to prevent excessive transpiration of the plants, which is commonly accompanied by increased susceptibility, and that the use of excess lime induced less resistance by diminishing the essential potash supply.

H.M.L. **The Sugar Cane in Queensland. Report of the Seventh Annual Conference of Sugar Cane Technologists.**—*Int. Sug. J.*, xxxviii, 451, pp. 248–250, 1936.

In a paper read before the Queensland sugar-cane technologists in April 1936, H. F. Bell stated that dwarf disease [*R.A.M.*, xi, p. 472; xv, p. 320] appears to be distinct from any known disease and its origin at Rosella in 1930 remains a complete mystery. It is probably due to a virus since cuttings from diseased stools gave rise to affected plants, irrespective of the soil type. On farms somewhat remote from the apparently original centre of infection spread seems to have been checked by the uprooting of the diseased stools, but this is not the case in the low-lying fields in the wetter areas of Rosella. The varieties chiefly affected are P.O.J. 2714 and Malagasche, particularly the former, but Clark's Seedling has also shown the disease, though M.1900 Seedling and Q.813 appear to be entirely unaffected. The only precautionary

method so far available is not to plant a susceptible cane where there is any likelihood of infection.

Brandes (E. W.) & Sartoris (G. B.). **Sugar-Cane: its origin and improvement.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 561–624, 14 figs., 1936.

In this exhaustive account of the development of modern sugar-cane varieties the authors state that in Louisiana the breeding value of parent varieties is estimated by the progeny test, which consists in determining the number and proportion of the various kinds of seedlings produced by an individual or cross. Two varieties that possess the essential characters between them are crossed, and if the resulting individuals approach the desired types, they and subsequent progenies are sent to the district for which the new variety is intended. During the first year every individual of the progeny is inoculated with mosaic, and the susceptible varieties are eliminated. Early in the autumn the sucrose content of all the individuals that approach commercial types is determined, those with a satisfactory sugar content and early maturity being segregated. The seedlings are then inoculated with different strains of *Colletotrichum falcatum* [*R.A.M.*, xv, p. 826], and those sufficiently resistant for commercial requirements are planted in increase plots on different soils. The next year the seedlings are subjected to the same treatment, and observations are made in the original planting to determine the stubbling qualities of the selected individuals. The varieties that continue to show promise are then sent to various localities to be increased, or planted in replicated variety tests. Before a new variety is released determinations are made of its yielding capacity per unit area, disease resistance, and the soil type to which it is best adapted.

All varieties of *Saccharum spontaneum* except Koelawi A are immune from mosaic, while all varieties of *S. officinarum* and all the forms cultivated in India are susceptible to infection. The hybrids of *S. officinarum* and the forms of *S. spontaneum* with 112 and 80 somatic chromosomes are immune, while the hybrids of noble varieties and the Indian forms of *S. spontaneum* are susceptible. *S. robustum* is susceptible.

Petrak (F.) & Sydow (H.). **Ein kleiner Beitrag zur Kenntnis der Pilzflora Japans.** [A small contribution to the knowledge of the fungus flora of Japan.]—*Ann. mycol., Berl.*, xxxiv, 3, pp. 237–251, 1936.

An annotated list is given of 29 Japanese fungi, of which nine are regarded as new to science and furnished with Latin and German diagnoses. *Haplosporella mali* [*Physalospora obtusa*: *R.A.M.*, xv, p. 31] was found on pear cortex and *Botryodiplodia malorum* [*P. mutila*: ibid., xv, pp. 31, 726] on pear and apple branches.

Kochman (J.). **Grzyby głowniowe polski.** [The smut fungi of Poland.]—*Planta polon.*, iv, pp. 1–161, 12 pl., 1 fig., 1936.

This is an account of the smuts which have been recorded to date in Poland. Some 130 old species are shortly described in Polish, and two new species of *Entyloma* on *Ranunculus* are proposed with Latin

diagnoses. Among the less commonly reported species may be noted *Tuburcinia* [*Urocystis*] *gladioli* on *Gladiolus imbricatus*, *T. primulae* on *Primula officinalis*, *Entyloma calendulae* on *Calendula officinalis* [*R.A.M.*, xv, p. 23], *E. cichorii* on chicory [ibid., xiv, p. 398], *E. dahliae* on dahlia [ibid., xv, p. 23], *E. winteri* on delphinium, and *E. fuscum* on opium poppy [loc. cit.].

HIRATSUKA (N.). **A monograph of the Pucciniastreae.**—Reprinted from *Mem. Tottori agric. Coll.*, iv, 374 pp., 11 pl., 1936.

The writer presents a world monograph of the Pucciniastreae, one of the five sub-families of the Melampsoraceae; he admits eight genera: *Pucciniastrum* (with 32 species), *Calyptospora* (1), *Melampsorella* (2), *Thekopsora* (15), *Uredinopsis* (17), *Melampsoridium* (4), *Hyalopsora* (9), *Milesina* (51). So far as is known, all the species whose life-histories have been elucidated are heteroecious, and their aecidial stages occur on needles or cone scales of *Abies*, *Picea*, *Tsuga*, or *Larix*. The general part includes an account of the general characters of the spermogonial, aecidial, uredospore, and teleutospore stages, the classification, the host plants, the phylogeny, and the world and local Japanese distribution of the species of this sub-family. The writer follows the almost universal interpretation of the International Rules of Nomenclature in not accepting as valid a generic name first applied to a uredo form. He accordingly maintains the name *Milesina* Magnus (1909) against *Milesia* White (1877), and has transferred some dozen outstanding species from the latter to the former genus.

In the special part, each genus is given a diagnosis, the type species is stated and the species keyed out on morphological characters. Each species is given a full description with a statement of the host plants, distribution, and published exsiccata. The volume, illustrated with some 60 microphotographs, closes with a bibliography of 523 titles, a fungus index of valid names and synonyms, and a host index.

BUCHWALD (N. F.). **Plantepatologiske Meddelelser 1–5.** [Phytopathological notes 1–5.]—*K. VetHøjsk. Aarsskr., 1936*, pp. 132–140, 2 figs., 1936. [English summary.]

Blossom wilt and die-back of young apple shoots has been found to be caused in Denmark by *Sclerotinia laxa* f. *mali* [*R.A.M.*, xv, p. 159].

All the specimens of *Pestalotia* [*Pestalozzia*] on *Rhododendron* leaves examined were found to belong to *P. macrotricha* [ibid., xiv, p. 608], the hosts of which include *Azalea indica* [*R. indicum*], *R. argyrophyllum*, and *R. sutchuenense*.

Beech seedling cotyledons have several times been found to be infected by *Gloeosporium fuckelii*.

Sphaerotheca [*humuli* var.] *fuliginea* [ibid., xii, pp. 396, 650] was observed on the cultivated *Veronica andersonii* and *V. myrtifolia*, apparently new hosts for this organism.

Danish-grown parsley seed was found in the winter of 1934–5 to show up to 20 per cent. infection by *Septoria petroselini* [ibid., xiii, p. 559], a common parasite of the leaves not known to have been previously reported on the seed.

HILL (A. V.) & ALLAN (J. M.). **Downy mildew (blue mould) of Tobacco. Attempts at control by the use of (I) sprays, and (II) heated seed-beds.**—*J. Coun. sci. industr. Res. Aust.*, ix, 3, pp. 220–232, 2 figs., 1936.

In comparative spraying tests against tobacco downy mildew (*Peronospora tabacina*) [*R.A.M.*, xv, p. 756] carried out in New South Wales and Victoria in 1934–5 it was found that in general copper emulsion protected the seedlings for a longer period than colloidal copper or Bordeaux mixture (4–4–40, or 2–2–40 when necessary). Subsequent spread was rapid in the unsprayed plots, and in many cases no seedlings suitable for transplanting were obtained. When infection occurred early few or no healthy seedlings were obtained from the plots sprayed with Bordeaux mixture but most seedlings from the other treated plots were healthy, copper emulsion giving slightly better control of rate of spread than colloidal copper. Repeated applications of Bordeaux mixture caused much stunting. The data obtained indicate that seedlings grown in areas comparatively free from infection are likely to remain healthy until reaching transplanting size if sprayed with copper emulsion or colloidal copper.

Tests with heated seed-beds indicated that it is impossible to prevent infection and at the same time obtain satisfactory seedlings by temperature regulation, while the degree of control of humidity obtained in the experiments was also insufficient to prevent occurrence and spread.

DIXON (L. F.), MCLEAN (RUTH A.), & WOLF (F. A.). **Relationship of climatological conditions to the Tobacco downy mildew.**—*Phytopathology*, xxvi, 8, pp. 735–759, 5 graphs, 1936.

The conclusions previously reported by the writers as to the dependence of tobacco downy mildew [*Peronospora tabacina*: see preceding and next abstracts] on weather conditions [*R.A.M.*, xiii, p. 603] have been further substantiated by observations in North Carolina and climatological data in 1933 to 1935.

Primary outbreaks of the disease do not necessarily occur on corresponding dates in successive years, but coincide with, or immediately follow, warm spells (1) when the minimum temperature of the surface layer of soil has been maintained at or above 50° F. for several days, and (2) when the seedlings are sufficiently large for the lower leaves to come into contact with the soil. Secondary infection may take place about a fortnight later during any kind of weather normally prevalent from March to May since dew is formed on the leaves each night. Sporulation is promoted by protracted periods of saturation with an overcast sky, and is abundant at a temperature range from 42° to 63° (optimum 56°); above 68° and below 36° few or no sporangia are formed, while maximum temperatures above 90°, accompanied by intense sunshine, inhibit profuse sporulation even when nocturnal conditions favour the process. Sporangial dissemination reaches a climax when windy conditions accompany or immediately follow periods of abundant sporulation. The general outbreak of downy mildew in any locality occurs about three weeks after the primary attack. The primary period of dissemination lasts about a fortnight and the secondary a week.

Recovery from downy mildew appears to be initiated by factors inherent in the tobacco seedlings rather than by any particular set of weather conditions, though the process is accelerated by warm, clear days and warm nights.

WOLF (F. A.), MCLEAN (RUTH A.), & DIXON (L. F.). **Further studies on downy mildew of Tobacco.**—*Phytopathology*, xxvi, 8, pp. 760–777, 6 figs., 2 graphs, 1936.

The writers' previous conclusions as to the importance of the oospores of *Peronospora tabacina* [see preceding abstract] as a source of inoculum for the strictly localized primary outbreaks of tobacco downy mildew in seed-beds in North and South Carolina [*R.A.M.*, xiv, p. 723] have been substantiated by further observations, which showed that sporangia were not present in the air until a considerable period after the primary outbreaks had taken place, and that a very small proportion of the oospores (less than 12 out of several thousand tested) are able to germinate. Further evidence was also obtained that seed-beds on old sites are liable to act as foci of initial infection.

The morphological features of *P. hyoscyami*, *P. nicotianae*, and *P. tabacina* [ibid., xiv, p. 657] are compared and discussed, and on the basis of these studies Adam is followed in referring the agent of downy mildew to *P. tabacina* [ibid., xiii, p. 132], though it is admitted that the morphological differences between *P. hyoscyami* and *P. tabacina* are not very great and that some might prefer to regard the latter as a variety of the former. The sporangia of *P. tabacina* measure 10·5 to 24 (mean 18·4) by 10·5 to 22 (15) μ, the oogonia 40 to 74 μ in diameter (53 μ), and the oospores 24 to 43 μ (32 μ).

Apart from the avoidance of previously used sites for seed-beds, the most important means of combating downy mildew consist in the provision of increased facilities for the access of direct sunlight to the seedlings and several applications to the beds of nitrate of soda.

CHESTER (K. S.). **Serological tests with Stanley's crystalline Tobacco-mosaic protein.**—*Phytopathology*, xxvi, 8, pp. 715–734, 7 graphs, 1936.

The Schultz-Dale modification (*Rep. med. Res. Coun., Lond.*, ix, p. 229, 1931) of the anaphylaxis test (based on the thesis that an animal injected with a small amount of protein develops, after about three weeks, a high degree of sensitivity towards that particular protein) was applied to materials containing a number of plant viruses. None of the viruses tested, viz., tobacco mosaic and ring spot [*R.A.M.*, xv, p. 751], peach yellows, rosette, and little peach [ibid., xv, pp. 516, 691], and the rugose, mild, and latent potato mosaics [ibid., xv, pp. 459, 614, and next abstract], gave anaphylactic reactions, as was shown in tests made both by absorbing the uterine muscles of a guinea-pig with healthy plant juices prior to testing for virus reaction (thereby eliminating the reactions due to healthy plant proteins), and by using as virus hosts for sensitization and testing, respectively, two plant species (tobacco and *Phlox*) so distantly related that the only common serological element was the virus [cf. ibid., xv, p. 671]. Healthy plant proteins, on the other hand, were highly anaphylactogenic. The proteins

of healthy tobacco and healthy tomato were found to be serologically very similar.

The uteri of guinea-pigs sensitized with healthy plant proteins reacted to solutions of Stanley's crystalline tobacco mosaic virus protein [ibid., xv, p. 754] and vice versa. Complement-fixation tests confirmed the results of the anaphylactic experiments by showing cross-reactivity between the crystalline and the healthy plant protein, a phenomenon apparently due to the presence in the former of a contaminating protein serologically allied to, or identical with, that of the healthy tobacco plant.

Considerable amounts of virus were detected in the crystalline materials as a result of precipitin and complement-fixation tests.

Precipitin tests of the sera from sensitized guinea-pigs indicated that in a given animal the tobacco mosaic virus may be a very active precipitinogen but anaphylactically passive, whereas healthy tobacco proteins in the same animal may be relatively inert in precipitin production but highly active in the stimulation of anaphylaxis. These data are held to imply that the mechanisms of the two reactions are quite different, although the same antibodies may be concerned in both.

Chester (K. S.). **Separation and analysis of virus strains by means of precipitin tests.**—*Phytopathology*, xxvi, 8, pp. 778–785, 1936.

A tabulated account is given of experiments in the differentiation of ten strains of tobacco mosaic and three of latent potato mosaic [see preceding abstract] by means of Helen P. Beale's absorption technique [*R.A.M.*, xiv, p. 197]. It was thus ascertained that ordinary tobacco mosaic (tobacco virus 1) and Holmes's masked tobacco mosaic [ibid., xv, p. 533] are closely related serologically while tomato aucuba mosaic [tobacco virus 6] [ibid., xv, p. 611] differs significantly from both but is allied to four out of seven of Jensen's yellow mosaic strains [ibid., xv, p. 533]. Serological distinctions were further established between the three latent potato mosaic strains—mottle, ring spot [ibid., xv, p. 459] masked mottle—and a strain of latent potato mosaic isolated by the writer from apparently healthy potatoes, which caused systemic infection without external symptoms in tobacco and *Datura tatula* and severe systemic necrosis in pepper [*Capsicum annuum*]. Not only did the precipitin technique used in these studies serve to differentiate the several virus strains, but it also gave some clues to their antigenic constitution.

Sheffield (F[rances] M. L.). **The susceptibility of the plant cell to virus disease.**—*Ann. appl. Biol.*, xxiii, 3, pp. 497–505, 1 graph, 1936.

A tabulated account is given of experimental work with tobacco, tomato, *Nicotiana glutinosa*, and *Solanum nodiflorum* plants, the results of which conclusively showed that the viruses of tobacco mosaic (Johnson's No. 1) and tomato aucuba mosaic [tobacco virus 6] cannot enter the plant unless some of the surface cells are injured. It was further shown on *N. glutinosa* with tomato aucuba mosaic that for infection to result it is not essential that the cells should be injured in the actual presence of the virus; the percentage of infection after

wounding, however, rapidly declined from 78·9 when the inoculum was applied after one minute, to 42·9 after four, 25·6 after ten, and down to 2·8 after 30 minutes. Inoculations of tobacco mosaic, tomato aucuba mosaic, and Hy. III [*R.A.M.*, xiv, p. 51] viruses with a micropipette into single cells of tobacco plants yielded only about one-tenth of the expected number of positive infections, suggesting the existence of differences in the susceptibility of the cells to virus attack.

Sheffield (F[rances] M. L.). **The role of plasmodesms in the translocation of virus.**—*Ann. appl. Biol.*, xxiii, 3, pp. 506–508, 1 pl., 1936.

An indirect support for the view that plant viruses travel from cell to cell along the protoplasmic bridges (plasmodesms) [*R.A.M.*, xiv, p. 51] is inferred by the author from her studies of epidermal strippings of virus-infected leaves of tomato, tobacco, *Hyoscyamus niger*, and *Solanum nodiflorum* (treated by Craft's technique for demonstrating plasmodesms), the results of which showed that guard cells, which have never been seen to contain the intracellular inclusions characteristic of many viruses in their appropriate hosts [loc. cit.], have no protoplasmic connexion with the surrounding cells. Likewise there appears to be no plasmodesms between the embryo and parent tissues, which may be a possible explanation of the non-transference of virus infection through seed.

Beaumont (A. B.). **A hypothesis to explain brown root rot of Havana seed Tobacco.**—*Science*, N.S., lxxxiv, 2173, pp. 182–183, 1936.

Preliminary researches are recorded on the nature and cause of tobacco brown root rot [*R.A.M.*, xii, pp. 477, 493] in Connecticut. Water culture experiments showed that ammonium compounds, amino acids, and certain amides were toxic to tobacco and caused symptoms very similar to those of brown root rot. Tobacco was found to be very sensitive to the toxic effects of unoxidized forms of nitrogen, whereas the nitrate was readily assimilated when tobacco was grown to maturity. The tops of affected field-grown plants contained more total nitrogen than normal field plants, but there was little difference as between the roots. Dressings with peat or monocalcium phosphate, both of which absorb or inactivate ammonia, in some cases reduced or eliminated the condition, while sodium and calcium nitrates did not, and lime reduced it only in the latter part of the season when it is thought to enhance nitrification. The disease was at its worst early in the season and in cool, wet seasons (when conditions were unfavourable to nitrification), and decreased late in July, when nitrification was at its peak. It was not transferred from one soil to another by inoculation, but was reduced or eliminated by air-drying of infected soil. It was severe following certain crops, particularly maize and timothy [*Phleum pratense*], but seldom occurred when tobacco was continuously grown, and badly affected fields usually recovered after one or two years of tobacco culture.

It is suggested that the disease is indirectly caused by the unoxidized forms of nitrogen that result from the decomposition of organic matter. The root-rotting is due to high nitrogen concentration in the

roots or a narrowed carbon-nitrogen ratio brought about by the rapid absorption of basic nitrogen, which makes the roots very susceptible to decay organisms present in the soil.

GARNER (W. W.), ALLARD (H. A.), & CLAYTON (E. E.). **Superior germ plasm in Tobacco.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 785–830, 12 figs., 1936.

In this comprehensive, semi-popular account of tobacco-breeding, progress is surveyed in the work of breeding against diseases, increasingly heavy losses from which in recent years render the problem of major importance in the United States.

MANDELSON (L. F.). **The Tobacco-growing industry in the United States of America. Tobacco diseases.**—*Qd agric. J.*, xlvi, 2, pp. 143–169, 25 figs., 1936.

A popular account is given of the principal diseases and pests of tobacco in the United States, and their control.

JOHNSON (J.). **Relation of root pressure to plant disease.**—*Science*, N.S., lxxxiv, 2171, pp. 135–136, 1936.

By means of the direct application of high-water pressure to the root system, water-soaking is readily induced in tomatoes, which thereby acquire an unwonted susceptibility to *Bacterium angulatum*. Tobacco plants similarly treated readily contract infection both by *Bact. angulatum* and *Bact. tabacum* [cf. *R.A.M.*, xvi, p. 2], developing large, necrotic lesions resembling those commonly observed in the field. Similar, though less striking, results were obtained by the increase of root pressure through the simultaneous exposure of plants to a high soil and low air temperature. High root pressures in the field are known to result from a particular sequence of weather conditions which is liable to precede epidemics of tobacco disease.

BARRADAS (H.). **Contribuição ao estudo das pragas do Tobaco.** [A contribution to the study of Tobacco pests.]—*Bol. Minist. Agric. Rio de J.*, xxv, 4–6, pp. 123–136, 15 figs., 1 graph, 1936.

In connexion with an account of the ravages of crickets (*Neocurtilla hexadactyla* or *Gryllotalpa vulgaris*) in the Brazilian tobacco plantations, some recommendations are made for the biological control of this formidable pest by the application to the soil of cultures of entomogenous fungi, e.g., *Beauveria bassiana* [*R.A.M.*, xv, p. 217], at the rate of 250 c.c. in 250 l. water. An Eclair (Vermorel) apparatus, preferably made of zinc, should be used with 30 to 100 lb. pressure, and the spraying should be carried out at the close of the rainy season.

BEST (R. J.) & SAMUEL (G.). **The reaction of the viruses of Tomato spotted wilt and Tobacco mosaic to the P_H value of media containing them.**—*Ann. appl. Biol.*, xxiii, 3, pp. 509–537, 6 graphs, 1936.

Further studies on the effect of the P_H value of the suspension media on the activity of the tomato spotted wilt virus [*R.A.M.*, xv, pp. 41, 404] are reported, together with the results of investigations on tobacco mosaic (Johnson's No. 1) virus. In all experiments the concentration of juice

was chosen to fall on the straight line portion of the dilution curve within which the primary lesion method gives a reasonably accurate estimate of relative concentrations of the virus [ibid., xiv, p. 781]. In regard to the virus of tomato spotted wilt, activity-time curves at constant P_H value showed that in the absence of oxygen and at 0° C. suspensions of the virus buffered at P_H 7 in general remain at constant activity for six hours or more. It was also found that under the same conditions the virus is inactivated at and below P_H 5 and above about 10, the activity remaining practically constant within the P_H range 6 to 8·9 for a half-hour or 5-hour contact. For the ordinary tobacco mosaic the activity-time curves at constant P_H value showed that when buffered at P_H 7 this virus did not change in activity for at least 24 hours at room temperature (about 20°). At about P_H 9 the activity begins by rapidly decreasing, but eventually a point is reached at which it remains constant. By adjusting the P_H value of the suspensions from 9 to 7 soon after preparation, a marked reactivation is brought about, but the amount of reactivation gradually grows smaller the longer the adjustment is delayed. Suspensions at P_H 2 cause significantly fewer lesions than the corresponding control inocula, whereas the activity of suspensions held at P_H 2 for various lengths of time and adjusted at P_H 7 before inoculation is practically the same as that of the controls at P_H 7; this difference is in part attributed to an effect on the host. The activity-P_H curves which were constructed for tobacco mosaic virus showed that the virus was inactivated above P_H 8·2 and below P_H 2, the inactivation being complete at P_H 11 and 0·5.

The results of these investigations are considered to indicate the necessity of eliminating the effect of P_H value on activity in future work with viruses. The very different nature of the P_H-activity curves for the two viruses studied suggests the possibility of using this relationship as a means of differentiating between viruses; among other applications, it is stated that the tomato spotted wilt virus may easily be removed from a mixture with tobacco mosaic by adequately adjusting the P_H value. With a virus such as that of tomato spotted wilt, the negative results obtained from reinoculation tests of expressed juice may be due to an inactivation of the virus by an acid juice, unless the P_H value of the expressed juice is within the range for activity. It is further pointed out that the activity-P_H curves of the two viruses resemble similar curves for enzymes more closely than curves for living organisms, while another argument in favour of the non-organismal nature of the virus of tobacco mosaic is adduced from its attainment of what appears to be a steady state at P_H 9.

NIGHTINGALE (ALICE A.) & RAMSEY (G. B.). **Temperature studies of some Tomato pathogens.**—*Tech. Bull. U.S. Dep. Agric.* 520, 36 pp., 9 graphs, 1936.

In experiments on the effects of maturity and temperature on the development of nine important fungi responsible for storage rots in tomatoes in the United States *Fusarium semitectum* [*R.A.M.*, xv, p. 775], *Phoma destructiva* [see above, p. 44], *Alternaria solani* [ibid., pp. 406, 690], and *Pleospora lycopersici* [ibid., xiv, p. 799] grew much

better on potato dextrose agar at P_H 6·01 (corresponding to ripe tomato juice) than at P_H 4·7 (green tomatoes), this result indicating that change in acidity is an important factor in inducing increased virulence of these organisms to ripe fruit.

Rhizoctonia [*Corticium*] *solani* [ibid., xv, p. 690] and *Melanconium* sp. [ibid., ii, p. 245] (*Phytopathology*, vi, p. 390, 1916) grew somewhat better at P_H 6·01 than at P_H 4·7 at temperatures most favourable to growth (65° to 85° F.). Both fungi develop on green, and rather better on ripe, fruits. The cardinal temperatures for *C. solani* were 45° to 49° F., 80°, and 90° to 95° and for *Melanconium* sp. 45° (on agar), 80°, and 90° to 95°. The latter withstood a week at 33° to 38°, and in inoculated fruits incubated (after one day at room temperature) at 35° to 41° caused slight lesions after 10 or 11 days. *C. solani* remained alive in inoculated tomatoes after 2 weeks at 32° to 41°, but all inoculations at temperatures below 50° were unsuccessful.

F. semitectum grew best at 75°; the maximum temperature for growth on agar was 92° to 95° and the minimum on agar 41° to 43° and on the fruit 45°; cultures on agar at 30° to 34° were alive after 3 days.

Colletotrichum phomoides [ibid., xiv, p. 121] grew faster on ripe than on green fruits. In culture, there was not much difference in growth rate at the two acidities. The optimum temperature for growth was 80°, the maximum 95°, and the minimum on agar was 35° and for lesion development 45°.

Cultures of *Phoma destructiva* withstood 32° for 20 days. The minimum temperature for growth on agar was 40° and for fruit decay 45°, and the maximum on agar was 85°, at which temperature inoculations gave doubtful results.

Cladosporium fulvum [ibid., xv, p. 690] showed no consistently different reaction at the two acidities, but growth was usually more rapid on the less acid medium at temperatures over 60°. The optimum temperature for growth on agar was 70°, the maximum 85°, and the minimum 32° to 35°. Some of the spores resisted a temperature of 93°.

The optimum of *A. solani* was 80°, its maximum 95°, and its minimum 35°; it remained alive at 30° to 32°, but no tomato decay occurred under 45°.

The growth of *A. tomato* was only very slightly favoured by the less acid agar, and was very rapid at P_H 4·7. The optimum temperature for growth was 85°, the maximum 95°, and the minimum 35°; slight decay was noted in green fruits on the eighth day at 32° to 41°.

Pleospora lycopersici showed a maximum temperature for growth of 87°, (but lived for a week at 93° to 97°), a minimum of 32° to 34°, and an optimum for lesion development on ripe fruits of 70°, and on green fruits of 65°.

CARTER (J. C.). **Thyrostoma compactum on Ulmus pumila.**—*Phytopathology*, xxvi, 8, pp. 801–804, 1 fig., 1936.

Thyrostoma compactum (Sacc.) v. Höhn. was found to be associated—obviously in a causal capacity, though isolation and germination experiments were a failure—with elm (*Ulmus pumila*) cankers in Illinois. The lesions mostly occurred at or near soil-level but were

occasionally observed near the top of the main stem of trees 25 ft. high; the outer host tissues shrivelled, collapsed, and adhered tightly to the stem, producing a girdling effect. Three to four weeks after the appearance of the canker, the dark brown to black, circular, convex, compact tubercles, 600 to 900 μ in diameter, 350 to 500 μ in height, force their way to the surface of the stem. The deep tan to brown, oblong, somewhat clavate, bi- to multicellular, partly muriform conidia, 39 to 54 by 13·3 to 16·6 μ (average 46·5 to 14·5 μ) are produced singly on short, tan, rod-like conidiophores over the outer face of the tubercle and accumulate as a compact mass at the top. Excision appears to be a satisfactory means of control.

Carter (J. C.). **Cytosporina ludibunda on American Elm.**—*Phytopathology*, xxvi, 8, pp. 805–806, 1936.

Cytosporina ludibunda, which was prevalent on American elms [*Ulmus americana*] in Illinois in 1934 [*R.A.M.*, xiv, p. 537] and to a lesser extent in 1935, was isolated in pure culture and inoculated into five potted trees, through wounds in three cases. All the trees developed signs of successful infection after an incubation period of 25 to 54 days, the first tree wilting completely in 54 days, but the re-isolation of the fungus was effected only in the case of the wounded individuals, the xylem of which showed a light brown discoloration.

Goidànich (G.). **Sulle cause della cosidetta 'defogliazione primaverile' del Pioppo in alta Italia.** [On the causes of the so-called 'spring defoliation' of the Poplar in upper Italy.]—*R.C. Accad. Lincei*, xxiv, 1–2, pp. 27–30, 1936.

An account is given of the writer's studies in Emilia, Lombardy, and Piedmont on the so-called 'spring defoliation' of poplars (*Populus canadensis*), which is stated to be particularly severe in the vicinity of Turin. The disease appears to be very similar to, if not identical with, that described by Vuillemin from France (*C.R. Acad. Sci., Paris*, cviii, p. 632, 1889) as due to a *Phoma* representing the pycnidial stage of *Didymosphaeria populina*, but subsequently attributed by Prillieux (loc. cit., p. 1133, 1889) to *Napicladium tremulae* (*Fusicladium radiosum*) [*Venturia tremulae*: see above, p. 5] the latter opinion being still generally held in Italy to-day. The writer, on the contrary, upholds Vuillemin's diagnosis of the condition as resulting from infection by a Sphaeropsid (termed G. 2191), the exact systematic position of which, however, is uncertain.

There are various important differences between the Sphaeropsid and *F. radiosum*, for which the author (in a forthcoming paper in *Ann. Bot., Roma*) has substituted the name of *Stigmina radiosa* (Lib.) G. Goid. The latter, in the first place, is almost exclusively a foliar parasite, whereas attacks by the Sphaeropsid originate in the branches, generally at the points of insertion of the buds, whence the fungus rapidly spreads both upwards and downwards. The portion of the shoot above the site of infection assumes a characteristic hook shape and shrivels, and the leaves fall. In pure culture, colonies of the Sphaeropsid attain a diameter of 5 to 6 cm. in ten days, during which period the growth of *S. radiosa* does not exceed 4 to 5 mm. The former gives rise to abundant

pycnidia while the latter produces conidia typical of the genus. (In a foot-note the author reports the development in cultures of *S. radiosa* of bodies suggestive of rudimentary perithecia, necessitating a future consideration of its relationship with *D. populina* or some other Ascomycete.) Both fungi may co-exist in the same locality and even on the same tree, and the symptoms induced by the virulent Sphaeropsid may be aggravated by the invasion of the relatively innocuous leaf parasite.

ROHDE (T.). **Beitrag zur Kenntnis einer krebsartigen Eichenkrankheit und ihrer Pilzflora.** [A contribution to the knowledge of a canker-like Oak disease and its fungal flora.]—*Mitt. Forstwirt. Forstwiss.*, vii, 1, pp. 63–116, 50 figs., 3 diags., 8 graphs, 1936.

An exhaustive account is given of the writer's laboratory and field studies on an oak canker affecting 20- to 25-year old trees in the Harz mountains and elsewhere in northern Germany. The vessels of the discoloured (pale yellowish- to dark reddish-brown) wood underlying the elliptical cankers on the stem were found to be occluded by tyloses and permeated by fungal hyphae, while the medullary rays were filled with wound gum. The fungi developing in pure culture on a medium of 4 per cent. malt extract and 2 per cent. agar were *Caudospora taleola* (Fr.) Starb., (?)*Dothidea noxia* (*Fusicoccum noxium*) [*R.A.M.*, xiv, p. 476], *Clithris quercina* (Pers.) Karst., and an apparently undescribed species of *Ophiostoma* [ibid., xv, p. 129]. Any one of these organisms may possibly be involved in the causation of the oak canker, but for the present the writer prefers to concentrate mainly on the last-named, which is described in detail. It is considered to fall within the *piceae-piliferum* group [ibid., xiv, p. 274] close to *O. fagi* and *O. quercus*, but it is identical with neither and for the present remains unnamed. A key supplemented by some explanatory comments, is given for the determination of the *Ophiostoma* (*Ceratostomella*) species so far recognized.

Evidence is adduced for the occurrence of heterothallism and intra-perithecial aversion in cultures of the oak canker *Ophiostoma*. Extensive inoculation experiments were carried out both with the fungus under discussion and with *O. quercus*, the results of which, however, were inconclusive and point at most to a very limited degree of pathogenicity to the oak, neither probably being concerned in the initial production of the cankers. The early stages of the disease are, indeed, very difficult to trace, but a connexion is believed to exist between the black discoloration and death of the cambium underlying fresh wounds and the ultimate development of cankers. In an attempt to gauge the silvicultural importance of the oak canker it was ascertained that 167 out of a stand of 522 trees (32 per cent.) were attacked, the average diameter of the diseased stems being 3·46 cm. and that of the healthy ones 2·98 cm.

CRANDALL (B. S.). **Root disease of some conifers and hardwoods caused by Phytophthora cambivora (P. cinnamomi).**—*Plant Dis. Reptr*, xx, 13, pp. 202–204, 1936. [Mimeographed.]

Phytophthora cinnamomi regarded by the author as a synonym of *P. cambivora* has been found during the last four years causing root rot of

chestnuts [ibid., xv, pp. 378, 616] in South Carolina (*Castanea dentata*), Georgia (*C. dentata*, *C. mollissima*, and Paragon hybrid), Tennessee (*C. dentata*), Louisiana (*C. mollissima* and *C. japonica*), and Arkansas *C. ozarkensis*); of *Taxus cuspidata* and spruce (*Picea excelsa*) in Virginia; and of pines (*Pinus resinosa* [ibid., xiv, p. 409] and *P. sylvestris*), *Picea pungens*, larch, Japanese and English yews, walnuts (*Juglans nigra* and *J. regia*), birches (*Betula papyrifera* and *B. alba*), oaks (*Quercus borealis*, *Q. montana*, and *Q. alba*), plane (*Platanus orientalis*), and *Robinia pseudacacia* in Maryland. The *Phytophthora cinnamomi* rot is mostly of the dry type and is accompanied in conifers by resin deposition. Black walnuts and *R. pseudacacia* develop a soft rot often combined with tap-root disintegration. The irregular, wedge-shaped streaks of infected tissue are usually reddish-brown but in walnut they are black. The first sign of the disease in conifers is the gradual loss of colour in the needles, while in hardwoods the entire seedling wilts suddenly. In oriental planes a premature reddening of the leaves is characteristic of the disease. Inoculation experiments in the greenhouse gave positive results on *Pseudotsuga taxifolia*.

ALBEN (A. O.) & BOGGS (H. M.). **Zinc content of soils in relation to Pecan rosette.**—*Soil Sci.*, xli, 5, pp. 329–332, 1936.

The results [which are discussed and tabulated] of soil analyses of pecan [*Carya pecan*] orchards in Texas and Louisiana showed the zinc content of the calcareous basic soils to be generally higher than that of sandy loam (acid) ones; the element, however, is apparently unavailable in the former, judging by the extensive occurrence of rosette [*R.A.M.*, xv, p. 543]. On soils with both acid and basic horizons the trees appear to be favourably influenced, as regards predisposition or otherwise to rosette, by the acid reaction. Soils having all acid horizons support pecan trees relatively free from rosette in the presence of a moderate quantity of zinc, indicating the availability of the latter. Acid soils containing minimum amounts of zinc produce trees with a tendency to rosette, showing that the element, though available, is insufficient in quantity to ensure a normal state of health.

BIBERDIEVA (Mme M. P.). О бактериофаге **Bact. mori,** возбудителе бактериоза Шелковицы. [The bacteriophage of *Bact. mori*, the etiologic agent of Mulberry bacteriosis.]—*Микробиол.* [*Microbiol.*], v, 4, pp. 590–591, 1 fig., 1936. [English summary.]

A description is given of experiments on the behaviour of the bacteriophage of *Bacterium mori*, the agent of mulberry bacteriosis in the U.S.S.R. [*R.A.M.*, xiii, p. 15; xv, pp. 627, 633] towards the homologous organism in meat-peptone agar cultures, the results of which indicated that this phenomenon may be of great value in the work of identification.

WAGENER (W. W.) & MIELKE (J. L.). **First blister rust found in California.**—*Plant Dis. Reptr*, xx, 14, pp. 220–221, 1936. [Mimeographed.]

The authors report the first case of *Cronartium ribicola* [see next

abstract] found in California, on *Pinus lambertiana*, near Monumental, in the Siskiyou National Forest, about 1½ miles south of the California-Oregon line, in June, 1936. A further infection centre on *P. lambertiana* and *Ribes cruentum* was also found at Camp Victoria, Oregon, in the same forest.

FINLAYSON (E. H.). **Report of the Director of Forestry, 1935–6 (fiscal year ended March 31, 1936).**—Issued by Dep. of the Interior, Canada, 44 pp., 1936.

In experimental operations against white pine blister rust [*Cronartium ribicola*: see above, p. 7, and preceding abstract] carried out since 1933 in the Petawawa Forest Experiment Station Area, Canada, preliminary control treatment has been given so far to about 15 sq. miles of valuable forest. The cost of the work has averaged 15 to 20 cents an acre. The future of white pine in North America is now entirely dependent on adequate control measures being taken against the rust.

To ascertain whether the dissolved salts contained in considerable quantities in many lakes in the Prairie Provinces in Canada might be effective as wood preservatives, 14 railway sleepers were submerged in Lake Manitou for eight months and placed on the track in 1921; up to 1933 only one had to be removed on account of decay.

Analysis of the distribution of preservative salts in spruce [*Picea* spp.] poles treated by injecting zinc chloride mixed with flour and water into alternate holes 1 in. in diameter bored longitudinally in the sapwood at the butt, the adjacent holes being filled with sodium arsenite paste, showed a satisfactory distribution of zinc arsenite in sections 6 in. below the ground, provided sufficient holes were used. For a butt of 10 in. diameter 16 holes are required. The insoluble salt is precipitated by the fanning-out of the two soluble salts, which are carried up the sapwood by the flow of moisture induced by evaporation from the top of the pole. The best results were obtained on green poles with the bark left on up to the ground line.

In investigations on the distribution of preservative salts in treated wood after drying, pieces of yellow birch [*Betula lutea*] impregnated with solutions of zinc chloride and mono-ammonium phosphate showed a fairly uniform distribution of both substances immediately after impregnation, but after kiln-drying a drop in concentration from the surface to the centre was very noticeable, and was more pronounced in severe than mild drying.

In comparative laboratory tests two out of four chemicals efficiently controlled blue stain [*Ceratostomella* spp. and other fungi: *R.A.M.*, xv, pp. 69, 271], but none gave satisfactory control of mould. Analyses of pulpwood from blockwood piles at pulp mills showed that unbarked wood suffers greatly from decay in storage as compared with barked wood. One lot of unbarked spruce and balsam fir [*Abies balsamea*] after 3 years' storage contained less than 6 per cent. sound wood, whereas two lots of barked wood from a 4-year-old pile (spruce, balsam fir, and Jack pine [*Pinus banksiana*]) contained 69 and 31·8 per cent. sound wood, respectively.

Rouppert (K.). **Blasenrost der Arve in der Hohen Tatra.** [Blister rust of the Siberian Stone Pine in the High Tatra.]—*Bull. int. Acad. Cracovie*, Sér. B 1, 8–10, pp. 241–252, 3 pl., 1935. [Abs. in *Neuheiten PflSch.*, xxix, 5, p. 189, 1936.]

With the aecidiospores of the *Peridermium* stage (*P. strobi*) of *Cronartium ribicola* from a Siberian stone pine (*Pinus cembra* var. *sibirica*) in the High Tatra mountains (Carparthians), the writer successfully inoculated *Ribes nigrum*, *R. rubrum* var. *hispidulum*, *R. petraeum* vars. *carpathicum* and *litwinowii*, *R. himalayense*, and *R. wallichii*. On the basis of these studies the rust is considered to be a physiologic form of *C. ribicola* quite distinct from that attacking white pines [*P. strobus*: see preceding abstracts].

Day (W. R.) & Peace (T. R.). **Butt rot of conifers.**—*Scot. For. J.*, l, 1, pp. 52–54, 1936.

In this further note on conifer butt rot [*R.A.M.*, xiv, p. 803] the authors state that in addition to the fungi previously mentioned, *Hypholoma fasciculare* [ibid., xiii, p. 605] and *Coniophora cerebella* [*C. puteana*] may also be associated with the condition. Douglas fir [*Pseudotsuga taxifolia*], Sitka spruce [*Picea sitchensis*], Japanese larch [*Larix leptolepis*], *Thuja* sp., and Lawson's cypress [*Cupressus lawsoniana*] have been found seriously affected.

Miller (P. R.). **Morphological aspects of Gymnosporangium galls.**—*Phytopathology*, xxvi, 8, pp. 799–800, 1 fig., 1936.

In the course of extensive surveys made for the purpose of studying the galls formed on *Juniperus virginiana* by *Gymnosporangium juniperi-virginianae* [*R.A.M.*, xv, p. 662], the writer has observed a greater profusion of galls on awn-shaped than on scale-like leaves. The examination of stained material of both types indicated that the galls taken from trees with awn-shaped leaves are of foliar origin, while those derived from trees with scale-like leaves originate on the stems. Another point requiring elucidation was the mode of emergence of the gelatinous spore horns through the tough cortex of the stem. Analysis of sections of fresh material disclosed the presence of circular cortex caps, perceptible on the surface of the gall as slight, pit-like depressions, which are lifted and pushed aside by the emerging spore horns.

Waterman (Alma M.) & Miller (J. A.). **A die-back of Douglas Fir.**—*Phytopathology*, xxvi, 8, pp. 804–805, 1936.

A die-back of Douglas fir (*Pseudotsuga taxifolia*), *Pinus nigra*, *P. strobus*, and *Picea pungens* in Long Island was found to be associated with a species of *Sphaeropsis*, characterized by brown, unicellular pycnospores measuring 24 to 40 by 9 to 15 μ, but with a few hyaline unicellular and brown bicellular spores among them. Apparently a similar disease has been referred elsewhere to *Sphaeropsis ellisii* [*R.A.M.* xv, p. 412] or *Diplodia pinea* [ibid., xiv, p. 483]. Douglas firs are not known to have been hitherto reported as hosts of species of either of these two genera in the United States, but J. S. Boyce in 1930 found a canker on Douglas firs in California associated with a *Sphaeropsis* corresponding to the Long Island fungus.

York (H. H.), Wean (R. E.), & Childs (T. W.). **Some results of investigations on Polyporus schweinitzii Fr.**—*Science*, N.S., lxxxiv, 2172, pp. 160–161, 1936.

In July, 1928, northern white pine (*Pinus strobus*) trees at Norwich, New York, showed a resinosis of the root crown and roots, the same condition being noted a year later near lakes Hemlock and Canadice. From the summer of 1933 onwards sporophores of *Polyporus schweinitzii* [see above, p. 8] were observed near the base of dead and diseased trees, but hundreds of cultures from resinosed lesions failed to yield this species though a greyish-black fungus developed in approximately 75 per cent. There was no evidence of any direct connexion between the resinosis and *P. schweinitzii*. Resinosis was most severe where the P_H value of the soil was 6 or more, and the colloidal content not under 52 per cent. In such areas, *P. schweinitzii* was very abundant, but it also caused serious damage where the P_H value of the soil was about 5·5 and the colloidal content under 46.

In 1934, advanced root decay due to *P. schweinitzii* was widespread both in *P. strobus* and red pine [*P. resinosa*] in plantings near lake Hemlock totalling about 1,200 acres; not one tree is expected to reach marketable size, the losses being the most serious recorded in forest plantings in the United States, and perhaps in the world.

In the districts affected by *Polyporus schweinitzii* the top 4 in. of soil contain nearly 21 per cent. more calcium than in unaffected areas, while the wood from diseased trees contains less calcium than that of normal trees. This suggested that the fungus renders the calcium in the soil less available to the trees, and analyses of a water extract of silica quartz sand from the roots of 3-year-old eastern white pine [*Pinus strobus*] seedlings grown in pot cultures, inoculated with the fungus, and supplied with nutrient, showed 25 times more calcium than in the uninoculated controls.

Polyporus schweinitzii was highly parasitic on the roots of 1- and 3-year-old white pine seedlings, especially in pot cultures with nutrient solutions of P_H 6 and 7 and a reduced phosphorus supply. Reddish streaks were present in the centre of roots under 2 mm. in diameter. Many isolations showed a wide range of cultural reactions, some being homothallic and fruiting readily; no clamp-connexions were observed.

Münch (E.). **Das Lärchensterben.** [The die-back of Larches.]—*Forstwiss. Zbl.*, lviii, 14, pp. 469–494; 16, pp. 537–562; 17, pp. 581–590; 19, pp. 643–671, 15 figs., 1936.

The outcome of the author's extensive researches on the dying-off of larches, commonly associated in Germany with the cankers due to *Dasyscypha willkommii*, though apparently of independent origin, has already been noticed from another source [*R.A.M.*, xv, p. 131].

Kaufert (F.). **Heart rot of Balsam Fir in the Lake States with special reference to forest management.**—*Tech. Bull. Minn. agric. Exp. Sta.* 110, 27 pp., 5 figs., 5 graphs, 1935. [Received November, 1936.]

After pointing out that increasing use is being made of balsam fir

(*Abies balsamea*) as a pulp wood in the United States, the author describes his investigations on heart rot of this tree due to *Poria subacida* [*R.A.M.*, xiv, p. 805], *Polyporus balsameus* [ibid., ix, p. 148] (both causing butt rot), and *Stereum sanguinolentum* (causing red top rot) [see above, p. 7], based on an examination of over 1,100 trees from 19 plots in northern Minnesota and Wisconsin.

The present stands are over-mature. Decay, cull, and liability to wind-breakage considered, the pathologic rotation should be set at not over 80 years, while merchantable trees may be grown in 60 to 70 years. Fifty-nine per cent. of the trees examined were rotted and of these 70 per cent. had butt rot only, 23 per cent. butt and top rot, and 7 per cent. top rot only. The number of trees with butt rot increased rapidly with increasing age after 40 years, 80 per cent. of trees 90 to 100 years old being affected. The average amount of decay in all the trees was 16·5 per cent. of the total volume (38·1 per cent. of merchantable volume), 8·7 per cent. (17·7) being due to butt rot, and 7·8 per cent. (20·4) to top rot. Of 642 trees with butt rot 73·4 per cent. showed the yellow stringy rot due to *Poria subacida*, 17·1 per cent. brown cubical rot (*Polyporus balsameus*), 3·7 per cent. showed both, and 5·8 showed red top rot (*S. sanguinolentum*) spreading to the stump and causing butt rot. On a volumetric basis, the percentages of rot were 89, 5·7, 4·7, and 0·6, respectively. The butt rot organisms usually enter the trees through broken side or tap-roots, the top rot organism entering through branch stubs. A blue stain fungus was prevalent in overmature trees.

SNELL (W. H.) & SHIPLEY (L. B.). **Creosotes—their toxicity, permanence and permanence of toxicity.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 32–115, 28 graphs, 1936.

This is a highly technical account, supplemented by 19 tables, of the writers' laboratory investigations on the toxic efficiency and permanence of toxicity towards wood-destroying fungi (represented by *Fomes annosus*) [*R.A.M.*, xiii, pp. 70, 556; xiv, pp. 276, 807] of different types of creosotes and mixtures of a given creosote with known amounts of coal tar and petroleum.

The coefficient of permanence of toxicity was computed from the quantities of each material left and its toximetric value originally and at the close of varying periods of exposure. The resultant data indicated that materials with higher initial toxicities and correspondingly higher initial coefficients maintain their relatively advantageous position throughout the three months covered by the tests. The low-residue creosotes were found to excel the high-residue brands in respect of permanence of toxicity. The toxicity possessed by the various materials used was shown to reside exclusively in their content of the 0° to 355° C. coal tar fraction. Non-toxic substances, such as petroleum and the residue above 355° from coal tar, exert a blanketing effect on the toxicity of this 0° to 355° fraction in an almost direct ratio to their proportions in the mixtures. According to the results of these tests, high-residue creosotes may properly be regarded as mixtures of low-residue creosotes with relatively small amounts of excessively light

coal tar oils and large quantities of residue above 355° of coal tar materials. The very light coal tar oils contribute somewhat to the initial toxicity of the high-residue creosotes, which is lost, however, during the early periods of exposure, while the excessive amounts of residue above 355° not merely dilute the toxicity of the low-residue material but impair such value as it possesses by their blanketing action.

The conclusion reached as a result of these experiments is that the low-residue creosote (No. 1, typical of the grades in common use) serving throughout as a control compares very favourably with the other materials tested.

[This paper was followed by a somewhat critical discussion (pp. 115–133) in which E. Bateman, E. O. Rhodes, H. Schmitz, and F. E. Cislak took part.]

Bateman (E.) & Baechler (R. H.). **A calculation of the toxicity curve from solubility data.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 136–145, 3 graphs, 1936.

Coal tar creosote deprived of tar acids gave approximately the same curve for the relationship between the percentage distilling below 270° C. and toxicity to *Fomes annosus* [see preceding and next abstracts] and *Trametes serialis* as naphthalene, chosen for these experiments as a representative of the toxic low-boiling hydrocarbons. It does not differ appreciably, moreover, from the relationship shown by the water-gas tar oils [*R.A.M.*, xv, p. 269] which have, in general, the same hydrocarbons as coal tar creosote but no tar acids. It is suggested, on the basis of the experimental data here presented, that the wood-protective action of coal tar creosote might be duplicated by other combinations of low-boiling toxic hydrocarbons, high-boiling non-toxic hydrocarbons, and high-boiling phenols.

Schmitz (H.). **The influence of the character of the petroleum on the initial toxicity to wood destroying fungi of creosote-petroleum mixtures.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 145–158, 3 graphs, 1936.

It would appear from the writer's experiments, using the standard Petri dish method, with *Fomes annosus* and *Trametes serialis* [see preceding abstracts], that the initial toxicity of creosote-petroleum mixtures [*R.A.M.*, xiv, p. 667; xv, p. 269] is influenced by the character of the petroleum as well as by the fungicidal activity of the creosote. Petroleum mixtures of high specific gravity seem to be less toxic than those of low specific gravity. The specific gravity of the three samples used in these tests varied inversely with the residue above 355° C. and directly with the amount of the sample distilling below that point. In other words, petroleum mixtures with a relatively low fraction below and a relatively high residue above 355° were more toxic than those with a relatively high fraction below and a relatively low residue above 355°.

[This paper was followed by a discussion by H. B. Carpenter, N. E. Kittell, and R. M. Alpen.]

Arnold (W. P.) & Boller (E. R.). **Clean treatments.**—*Proc. Amer. Wood Pres. Ass.*, xxxii, pp. 390–411, 4 figs., 6 graphs, 1936.

The principal 'clean' treatments of wood (i.e., those which do not appreciably alter the appearance and other superficial characters of the original material) at present in use in the United States are those carried out with aqueous salts or creosote. In the case of the former the wood should be kiln-dried or seasoned after treatment and the moisture content reduced to a value corresponding to the future conditions of use. The toxicity of various salts towards *Lentinus lepideus*, *Lenzites sepiaria*, and *Coniophora cerebella* [*C. puteana*] was tested by the standardized wood-block [*R.A.M.*, xv, p. 621] and small sapling (outdoor) methods [ibid., xiv, p. 276], the latter being generally more satisfactory; southern yellow pine [*Pinus palustris*] was used in both series. The most generally promising of the salts was a combination of sodium bichromate and zinc chloride (1:5) [ibid., xv, p. 414], though in the laboratory tests *C. puteana* was better controlled by a fluoride-arsenate-chromate phenol mixture.

Most of the objections raised to creosote treatments are based on the tendency to 'bleeding' of wood thus handled [ibid., xv, p. 623], especially in the case of outdoor installations treated by the full-cell process; suggestions for overcoming this defect include the adoption of the empty-cell process combined with the minimum retention of creosote compatible with satisfactory penetration.

Regulations made under the Importation of Plants Regulation Ordinance, 1935. No. 4 of 1936.—6 pp., 1936.

Under the Importation of Plants Regulations, 1936, effective as from 1st February, 1936, and applicable to the Colony and Protectorate of Nigeria (including the Cameroons under British Mandate), the importation of the following is prohibited: all plants in soil other than special rooting compost; all cacao plants from Central and South America and the West Indies; all plants other than cacao from countries known to harbour witches' broom disease [*Marasmius perniciosus*: *R.A.M.*, x, p. 144; xv, p. 561] as specified by notice in the *Gazette*; all coco-nuts in husk from Central and South America and the West Indies; all coffee cherry unless certified free from mealy pod disease [*Trachysphaera fructigena*: ibid., xv, p. 153]; and all cotton seed unless free from lint. Any plant or seed, except seeds, bulbs, tubers, or corms of vegetables or ornamental plants from temperate countries, or dry, hulled rice, coffee, or pulses for consumption, is liable to inspection, and treatment or destruction if necessary. Subject to the provisions of these regulations, the importation of cacao, cotton, cassava, and *Musa* (all species) plants and seeds, oil palm and citrus (all species) plants (not seed) shall be permitted from West African countries included in the Plant Interchange Schedule only under permit signed by the Director of Agriculture, which is not required, however, in the case of plants and seeds of coco-nuts, kola [*Cola acuminata*], coffee, groundnuts, yams, rice, pulses, guinea corn [sorghum], millets, maize, and rubber [*Hevea brasiliensis*]. Importation of the latter group from other countries requires certification (except for articles for consumption).

Summaries of Colonial rules for importation of plants.—*Agric. Live-Stk India*, vi, 4, pp. 548–595, 1936.

Summaries of plant import legislation in force as at 31st December 1934 are given in the following Colonies and Dependencies: Gold Coast, Nigeria, Gambia, Nyasaland [see next abstract], Dominica, Cyprus, Kenya, Montserrat, Zanzibar, Barbados, St. Kitts-Nevis, Trinidad and Tobago, St. Lucia, Southern Rhodesia, Northern Rhodesia, Uganda, Ceylon, Jamaica, British Solomon Islands, St. Vincent, Mauritius, Tonga, Antigua, Sierra Leone, Palestine, Maltese Islands and Gilbert and Ellis Islands, together with more recent regulations for Nigeria [see preceding abstract].

Proclamations Nos. 10 and 11 of 1936.—*Nyasald Govt Gaz., Suppl.*, 2 pp., 31st August, 1936.

Proclamation No. 10 of 1936 (made under the Nyasaland Plant Pests and Diseases Ordinance [of 1924, *R.A.M.*, iv, p. 255]) permits the importation of rose plants into Nyasaland from Australia, Canada, or the United States only if officially certified in the exporting country as free from any virus disease. Proclamation No. 11 of 1936 prohibits the importation from any countries except the Union of South Africa, Southern Rhodesia, Northern Rhodesia, and the Belgian Congo of eucalyptus, acacia, oak, and plane plants or parts thereof, except seed and manufactured products; live peach stones; fresh stone fruits; fresh citrus fruits and dried (but not candied) citrus peel; elm and chestnut seeds and plants; any plant packed in soil other than special rooting compost; apples, pears, quinces, and loquats; and unmanufactured broom corn [*Sorghum vulgare*] unless the crowns are cut away or crushed.

British Guiana. Orders in Council Nos. 551 and 552 of 2nd April 1936.—*Official Gazette*, 11th April, 1936.

Order No. 551 prohibits the importation into British Guiana of sugar-cane, grasses, soil, and, except with the written authorization of the Director of Agriculture, banana and plantain suckers [cf. *R.A.M.*, xv, p. 464]. Order No. 552 enacts that all other living plants, and parts thereof intended for propagation, are subject to examination by an inspector who may demand the certificate of health provided by the country of export.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 9, pp. 202–204, 1936.

TURKEY. Under a Law passed on 29th January and effective as from 5th February, 1936, all plant consignments imported into Turkey must be accompanied by duly authenticated certificates of health and origin. A list of the diseases and pests to be excluded will be supplied by the Ministry of Agriculture to the countries interested. Certificates for the export of plants will be granted only when the merchandise complies with the requirements of the importing country. Provision is also made for internal phytosanitary administration, and the importation, production, and sale of plant protectives are placed under the control of the Ministry of Agriculture.

IMPERIAL MYCOLOGICAL INSTITUTE

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MOLL (F.). **Holzschutz im Wandel der Zeiten.** [Timber preservation through the ages.]—*Holzmarkt, Berl.*, liii, 192, 196, 198, 200, 7 pp., 5 figs., 1936.

Attempts at wood preservation against fire and sea damage, insect depredations, and fungal decay have been made since the days of remote antiquity, and an interesting account is here presented of its gradual development from very primitive beginnings to the highly technical and scientific process in general use to-day.

BERTRAND (G.) & DE WAAL (H. L.). **Recherches sur la teneur comparative en bore de plantes cultivées sur le même sol.** [Studies on the comparative boron content of plants cultivated on the same soil.]—*Ann. Inst. Pasteur*, lvii, 2, pp. 121–126, 1936.

A tabulated account is given of the writers' analyses, by a colorimetric method, of the boron content of a number of different plants cultivated on the same soil, from which it appears that the amount of this element varies greatly—from 2·3 mg. per kg. of dry matter in barley to 94·7 mg. in poppy. The other cereals are also poor in boron, rye, wheat, and maize showing 3·1, 3·3, and 5 mg. per kg., respectively, while the Leguminosae, for instance, are richer, containing between 35 and 70 mg. Of the two Chenopodiaceae tested, the boron content of spinach is only 10·4 mg., while that of beets is relatively high (75·6). In this connexion attention is drawn to the natural weakening of resistance to heart rot of beets [*R.A.M.*, xvi, p. 11], with their normally abundant supply of boron, through cultivation in soil receiving nothing but synthetic fertilizers from which this element is virtually absent.

GRAM (E.). **Bormangel og nogle andre Mangelsygdomme.** [Boron deficiency and some other deficiency diseases.]—*Tidsskr. Planteavl*, xli, 3, pp. 401–449, 10 figs., 1 diag., 1936. [English summary.]

Brown heart of swedes [see next abstract] has been most serious in Denmark in dry years on light calcareous soils. Experiments from 1931 to 1935 confirmed the Canadian results that the disease is controlled by the application of 15 kg. borax per hect. Increasing the P_H of the soil by liming resulted in a corresponding increase in the incidence of the disorder, while the incorporation of sulphur (400 kg. per hect.) depressed the P_H from 7·0 to 5·8 and markedly improved the quality

of the roots. The liberal use of farm or liquid manure, sodium or calcium nitrate, or especially ammonium sulphate reduced the extent of brown heart, which was aggravated, on the other hand, by calcium cyanamide. Heart and dry rot of sugar beets [see preceding abstract] and mangolds was also prevented by applications of 15 kg. borax per hect., 30 kg. being rather more profitable in severe outbreaks. Treatment in August after the disease appeared was fairly effective. A strong residual effect of the borax was manifest the second year after treatment.

In 249 experiments in the control of reclamation disease [*R.A.M.* xv, pp. 72, 792] by the application to the soil of 50 kg. copper sulphate per hect., the average increase in the barley and oats yields amounted to some 500 kg. per hect. The dressing of moor soils with sand, or better still clay (or marl on lime-deficient soil) is advantageous. In addition to the hosts of grey speck in Denmark already listed [ibid., xv, p. 73], the disease is stated to affect spinach, tomatoes, timothy [*Phleum pratense*], and tall oat grass [*Arrhenatherum avenaceum*]. In 70 experiments in the control of this disturbance in oats, barley, and mixed stands of these two crops, the application of 50 kg. manganese sulphate per hect. increased the output by an average of 430 kg. per hect. Grey speck is rare on sandy soils with a P_H of less than 6·0 and on clay lower than P_H 7·5. Sulphate of ammonia (200 kg. per hect.) or ground sulphur is also effective against this disease.

JAMALAINEN (E. A.). **Tutkimuksia Lantun ruskotaudista.** [Investigations on brown heart of Swedes.]—*Valt. Maatalousk. Julk.* 72, 116 pp., 26 figs., 4 diags., 1935. [Finnish, with German summary. Received November, 1936.]

An exhaustive, fully tabulated account is given of the writer's studies in Finland on brown heart of swedes and its control by the enrichment of the soil with boron [*R.A.M.*, xv, p. 475].

WOODCOCK (J. W.). **Brown-heart (mottled heart) in Swedes. Report on field trials with borax.**—*N.Z. J. Agric.*, liii, 2, pp. 99–104, 1 fig., 1936.

In experiments carried out in New Zealand on the control of brown heart of swedes [see preceding abstracts], the application of fertilizer mixed with borax (10 lb. per acre) was completely successful in six trials, and considerably reduced the incidence of the condition in a further six, while no brown heart developed in the four remaining experiments. Germination was adversely affected by the borax in four instances.

It is recommended that the borax should be applied at the rate of 20 lb. per acre, mixed with fine, dry sand and broadcast over the soil just before sowing. If applied with fertilizer and sown with the seed, not more than 8 lb. per acre should be used, to avoid germination injury. Fertilizers should not contain free lime, and where the condition is prevalent liming should not be effected immediately before sowing.

COONS (G. H.). **Improvement of the Sugar Beet.**—*Yearb. Agric. U.S. Dep. Agric.*, pp. 625–656, 7 figs., 1936.

In this account of the breeding of sugar beets the author states that

the new curly top-resistant varieties U.S. 33 and U.S. 34 [*R.A.M.*, xv, p. 418] will probably come into use in the United States on a large scale in 1937.

Work on the development of sugar beet strains resistant to *Cercospora* leaf spot [*C. beticola*: ibid., xiii, p. 611; xv, p. 764] has been in progress since 1925. The data obtained show that some progress can be made by selection under severe epidemic conditions. The absence of highly resistant individuals in present commercial stocks makes it almost impossible to select on a basis of the degree of leaf infection, but by using criteria based on weight development and sucrose content improved strains have been obtained. By means of selection and inbreeding, lines of beets stabilized in resistance have been secured to serve as a basis for the production of hybrids or synthetic varieties. The lines so far secured are highly resistant but insufficiently productive for commercial purposes. The first large-scale use of the resistant lines will be possible in 1937 with two synthetic varieties, accessions 217 and 220.

NIELSEN (O.). **Varmvandsbehandling af Kaalfrø.** [Hot water treatment of Cabbage seed.]—*Tidsskr. Planteavl*, xli, 3, pp. 450–458, 1936.

Excellent control of *Alternaria brassicae* (Berk.) Bolle [*R.A.M.*, xv, p. 188] and *A. circinans* [*A. oleracea*: ibid., xiv, p. 494] in white cabbage and cauliflower seed is stated to have been obtained in Danish experiments from 1934 to 1936 by 30 minutes' immersion in water heated to 45° C. or 20 at 50°, while substantial elimination was secured by 30 minutes at 40°. The treatment further exercised a very beneficial effect on germination, the incidence of which was increased by up to 13 per cent. A number of miscellaneous fungi (*Penicillium* and *Mucor* spp. and the like) occasionally found contaminating cabbage seed are also amenable to the hot water treatment.

JAMALAINEN (E. A.). **Herneen siementen sisäinen turmeltuminen.** [Internal necrosis of Pea seeds.]—*Valt. Maatalousk. Julk.* 79, 6 pp., 2 figs., 1936. [Finnish, with English summary.]

Previous literature on internal necrosis (marsh spot) of peas [*R.A.M.*, xv, p. 767] is summarized, and a brief note given on the occurrence of the disease in the Ahvenanmaa archipelago of south-western Finland, whence it was first reported in 1929, causing 6·5 per cent. infection of the sample submitted for examination. In 1933 a batch of 7,000 kg. of pea seed from the same district showed 8·3 per cent. damage from marsh spot. The germination percentages of selected healthy and diseased seeds from the sample under observation were 80·9 and 62·5 per cent., respectively; no evidence of the transmission of the disorder through the seed was obtained. It is thought that the disease is undoubtedly due in Finland and elsewhere to peculiarities associated with the district where the crop is grown.

ZAUMEYER (W. J.) & WADE (B. L.). **Pea mosaic and its relation to other legume mosaic viruses.**—*J. agric. Res.*, liii, 3, pp. 161–185, 4 figs., 1936.

Continuing their studies on the virus diseases of leguminous crops [*R.A.M.*, xv, p. 274] the authors found that pea mosaic is present in

the Western United States wherever peas are cultivated, but is more serious in the varieties grown for marketing as green peas or for seed than in the canning varieties. The disease was usually more severe along the borders than inside the fields, suggesting the transmission to peas of other legume viruses, a suggestion which was confirmed by cross inoculations which demonstrated that the mosaic viruses of red clover (*Trifolium pratense*), white clover (*T. repens*), white sweet clover (*Melilotus alba*), and alsike clover (*T. hybridum*) are infectious to peas. While under certain environmental conditions the symptoms [which are described in some detail] produced by these viruses may be similar to those of the common pea mosaic, the viruses of the white and alsike clovers and of white sweet clover can be differentiated from those of the pea and red clover mosaics by means of the Dwarf Telephone, Tall Telephone, and Green Giant pea varieties, on which the white clover and white sweet clover viruses produced, in addition to the usual mottled symptoms, necrotic lesions on the inoculated stems and leaves. The symptoms produced by the viruses of pea and red clover mosaic are very similar, and it is believed the two viruses are identical. The six viruses studied may also be separated, apart from symptomatological differences, by their reaction on the Stringless Green Refugee, Corbett Refugee, Robust, and Resistant Great Northern Idaho No. 1 bean varieties, and on *Vicia faba*.

Of the 42 [listed] varieties of pea which were tested, ten proved immune from the pea mosaic and eight from the red clover virus; three varieties out of 40 did not show the mottled symptoms of white clover virus, but all exhibited necrotic lesions, and only one appeared to be highly tolerant. The white sweet clover virus produced mottled symptoms on 38 and necrotic lesions on 39 varieties, and seven varieties were immune from alsike clover virus 1. In a special series of tests it was shown that out of 3,057 seeds collected from virus-diseased pea plants only 11 transmitted the disease.

WAGER (V. A.). **Bacterial wilt and blight of French Beans.**—*Sci. Bull. Dep. Agric. S. Afr.* 149, 19 pp., 11 figs., 1936.

A description is given of bacterial blight of French beans (*Phaseolus vulgaris*), which in South Africa was attributed in 1918 to *Bacterium phaseoli* [*R.A.M.*, xv, p. 765], but is now shown to be due for the most part (in all cases except two of those examined) to *Phytomonas* [*Bact.*] *medicaginis* var. *phaseolicola* [ibid., xv, p. 782], though the former organism occurs sporadically. The disease has caused considerable losses in eastern and southern Transvaal since 1930, but the incidence varies from crop to crop and season to season. The worst epidemic appeared throughout the Tonetti district of the eastern Transvaal at the end of the autumn of 1935; this attack was induced by a severe storm, and hundreds of acres produced no crop. Seed from the same source sown in adjacent patches after the storm gave no disease, so that the soil must have been heavily infected, the splashing caused by the storm setting up infection.

Wound inoculations in the stems with *Bact. medicaginis* var. *phaseolicola* led to the death of the plants in periods ranging from 10 days to 4 weeks. Great variation in virulence of the isolations was also observed

when injured and uninjured leaves were inoculated, and the fact that the latter inoculations were successful confirmed the existence of positive stomatal infection. In general infections resulted from the use of diseased seed, temperature and humidity probably exerting a considerable effect on the amount of disease developing. No infection of the roots took place from diseased soil.

Seed treatment does not appear to give satisfactory results, but the sorting out of all visibly infected seeds eliminates practically all initial infection, and is strongly recommended as the first step to producing a clean crop. Of the following comparatively resistant varieties, viz., Magpie, Superlative, Abondant, Ne Plus Ultra, Unrivalled, Asgrow's Black Valentine, Sutton's Prince, Black Prince, Vilmorin's Dwarf Lignereux, and Black Wonder, the four last are the best and conform most closely to South African requirements. Black Wonder has been grown on a large commercial scale for two seasons with great success.

Galatchyan (R. M.). Бактериозы Фасоли, их вредоносность, распространенность и пути инфекции. [Bacterioses of French Beans, their injuriousness, distribution, and modes of infection.]—*Summ. sci. Res. Wk Inst. Pl. Prot. Leningr., 1935*, pp. 513–515, 1936.

A survey in 1935 showed that French beans [*Phaseolus vulgaris*] on the Azoff-Black Sea littoral are attacked by *Bacterium phaseoli* and its var. *fuscans* [*R.A.M.*, xiv, p. 565], *Bact. medicaginis phaseolicola* [see preceding abstract], *Bact. vignae* [cf. ibid., xv, p. 16] and its var. *leguminiphila* [ibid., xiv, p. 565] and *Bact. heteroceum* [ibid., xv, p. 749], among which the first-named is stated to be economically the most important. While no varieties of French beans have yet been found entirely immune from bacterial diseases, certain varieties, such as 'Tepari' and 'Sladkaya Parnaskaya' are comparatively resistant.

Bennett (L. S.). **Studies on the inheritance of resistance to wilt (Fusarium niveum) in Watermelon.**—*J. agric. Res.*, liii, 4, pp. 295–306, 1 fig., 5 graphs, 1936.

A brief account is given of work in West Virginia, in which an inedible watermelon imported from Russia, resistant to wilt (*Fusarium* [*bulbigenum* var.] *niveum*) [*R.A.M.*, xvi, p. 14], was crossed with the susceptible commercial Early Fordhook variety. The results of tests of the reactions of the F_3 hybrids and of the progenies of selfed back-cross plants in the greenhouse, to three physiological strains of the parasite showed that a larger proportion of the families from back-crosses to the Russian parent were resistant, than of the families from back-crosses to the susceptible parent, indicating that resistance to wilt is inherited. There was also evidence of transgressive segregation. The fact that the F_3 progenies and the back-cross families could not be divided into distinct resistant and susceptible groups suggests that resistance is probably dependent on several factors; there was an indication that at least a part of these factors is cumulative in its action, since the reaction of the F_1 progenies was intermediate between that of the parents. No close linkage was apparent between resistance and any of the other characters studied, so that it may be possible eventually to combine resistance and commercial quality in the same melon.

WILLIAMS (P. H.). **A disease of Mushrooms new to Great Britain.**—*Gdnrs' Chron.*, c, 2591, p. 147, 1 fig., 1936.

In July, 1936, *Pseudobalsamia microspora* [*R.A.M.*, xv, p. 138] was detected in a mushroom [*Psalliota campestris*] bed at the Cheshunt Experimental and Research Station, this being the first record of the fungus in England. It occupied the casing soil and the superficial layers of the compost, forming a dense mycelial mat with numerous cream-coloured to reddish-brown, subspherical to discoid, irregularly lobate ascocarps, $\frac{1}{8}$ to 1 in. in diameter. *Pseudobalsamia microspora* does not appear to parasitize the mushrooms themselves, but spreads through the beds in such a way as to impede their proper development. The occurrence of this new disease is a further argument in favour of the routine sterilization by heat of all soils intended for the casing of mushroom beds.

RUI (D.). **Relazione sul funzionamento degli osservatori antiperonosporici della provincia di Treviso.** [Report on the activities of the anti-mildew forecasting stations in the province of Treviso.]—*Annu. Staz. sper. Vitic. Conegliano*, v, pp. 241–284, 1935. [Received November, 1936.]

Reviewing the data [which are tabulated] supplied during 1934 by the stations set up in the province of Treviso, Italy, for forecasting attacks of vine mildew (*Plasmopara viticola*) [*R.A.M.*, xii, p. 199], the author concludes that one to four superfluous spray applications were obviated as a result of the warnings issued by the stations.

Plantesygdomme i Danmark 1935. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1935. Survey of data collected by the State Phytopathological Service.]—*Tidsskr. Planteavl*, xli, 4, pp. 533–570, 4 figs., 2 graphs, 1936. [English summary.]

In addition to information already noticed from other sources, this report contains the following items of interest [cf. *R.A.M.*, xv, p. 72]. Potato wart (*Synchytrium endobioticum*) was found in 27 new municipalities [ibid., xvi, p. 56]. Hazel nuts [*Corylus avellana*] affected by brown rot consistently yielded *Monilia* [*Sclerotinia*] *fructigena*. A new bacterial leaf spot occurred on *Aspidistra*. *Phyllosticta richardiae* [ibid., xi, p. 517] was responsible for widespread spotting of leaves of *Zantedeschia* [*aethiopica*]. New records for the country are *Didymascella thujina* [ibid., xiv, p. 794] on *Thuja plicata*, *Erysiphe* sp. on *Kalanchoë* [cf. ibid., xiv, p. 637], and *Phytophthora* (?) *cactorum* on strawberries [ibid., xii, p. 266].

McDONALD (J.). **Report of the Senior Plant Pathologist.**—*Rep. Dep. Agric. Kenya, 1935*, ii, pp. 1–15, 1936.

An alleged break-down in the resistance of Blue Mountain coffee to coffee berry disease [*Glomerella cingulata*: *R.A.M.*, xv, p. 482] in the Kipkarren district, Kenya, was ascertained to be due to its free admixture with other varieties. Coffee given good cultural methods and sprayed in January and July with 1 per cent. Bordeaux mixture showed 4·3 and 9·1 per cent. infection for multiple- and single-stem plants,

respectively, as against 14 and 25·8 per cent. in the corresponding unsprayed controls. Multiple- and single-stem coffee sprayed annually since 1932 in March and July with 0·5 per cent. Bordeaux mixture in 1935 showed 11·2 and 13·6 per cent. infection, as against 22·4 and 31·9 per cent. in the controls.

Blue Mountain appears from preliminary observations to be resistant to the Elgon die-back [ibid., xv, p. 214].

By far the most prevalent form of wheat stem [black] rust [*Puccinia graminis*] was K4 [ibid., xv, p. 483].

Germination tests with maize seed from two ears, one apparently unblemished, the other with a slightly dull pith, showed the former to be much the more vigorous and almost entirely free from ear rot (*Fusarium moniliforme*) [*Gibberella moniliformis*], though over half the seed from the dull ear became infected.

Sorghum seed dusted with agrosan G and abavit B gave, respectively, 1·2 and 2·1 per cent. smut (*Sphacelotheca sorghi*) in the resultant crop, as against 26·4 per cent. in the untreated control [ibid., xv, p. 558].

Linseed seedlings raised from Njoro seed were affected with a species of *Rhizoctonia*, believed to be *R.* [*Corticium*] *solani*, inoculations with which proved it to be highly virulent.

Lilium philippinensis and *L. harrisii* plants in a commercial nursery were affected by a disease apparently identical with the third type of Easter lily mosaic described by Ogilvie and Guterman [ibid., viii, p. 577].

New records included anthracnose of banana fruits (*Gloeosporium musarum*), *R. bataticola* [*Macrophomina phaseoli*] on groundnut roots, *Puccinia menthae* [ibid., xv, p. 527] on *Mentha piperita* and *M. arvescens* var. *piperascens*, and *Cladosporium cucumerinum* and *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* on cucumber.

Storey (H. H.). **Report of the Plant Pathologist.**—*Rep. E. Afr. agric. Res. Sta., 1935–36*, pp. 11–14, 1936.

This report [cf. *R.A.M.*, xv, p. 203] contains the following items apart from those already noticed from other sources [ibid., xv, pp. 529, 645]. Two quite distinct virus diseases are now known to affect cassava in the Amani district, and probably elsewhere in East Africa. One is the well-known mosaic [ibid., xv, pp. 204, 701]. The other, which appears to have been present locally for several years, but unrecognized, is characterized by dark brown stripes on otherwise green stems and a yellow mottling of leaves in the later stages of growth. The stem lesions remain as sunken areas when the stem heals over, and if badly affected the stem readily breaks off at ground-level. The condition is transmissible by grafting and is independent of mosaic, though both diseases often occur on one plant. The leaf mottle is suggestive of nutritional deficiency, rather than a virus disease. Most of the affected plants growing during the cool season in 1935 in Amani lost all their stems by breakage and only shootless stumps remained, but with a rise in temperature the plants recovered to a large extent. At temperatures most favourable to the growth of cassava the effects of the disease are relatively mild.

The local cassava mosaic strains fall into two groups, those producing

a severe yellow mosaic with extreme leaf distortion and general stunting, and those producing a mild, green mosaic with little general ill effects. The attempt to obtain immunity from the severe strains by infection with the mild ones definitely failed, while control by breeding from the local varieties does not appear at all promising. A marked seasonal difference in the rate of secondary spread was observed during the last two years.

Forty-ninth Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1935–1936.—44 pp., 1 fig., 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xv, p. 559]. During the period under review over 6,000 mosaic peach [ibid., xv, p. 816] trees were eradicated from the Palisade-Grand Junction area, to which the disease is confined. Two of the 14 species of insects tested for their capacity to transmit mosaic under orchard conditions were proved to be implicated in the spread of the disease. So far the control measures adopted have been 60 to 70 per cent. effective, so that there is every hope of eliminating all centres of infestation in a few years.

Part of the work on potato improvement consists in inbreeding on several varieties and seedlings and making crosses between Katahdin and Russet Rural, Katahdin and Irish Cobbler, and Seedling 252 and Rural with a view to developing earlier maturing seedlings with increased resistance to scab [*Actinomyces scabies*: ibid., xvi, p. 58] and virus diseases. The Chippewa variety, which is being tested in the potato-growing sections of the State, is more susceptible to scab than Katahdin.

Levine (M.). **Plant tumors and their relation to cancer.**—*Bot. Rev.*, ii, 9, pp. 439–455, 1936.

Following an introductory section on the possible bearings of crown gall (*Bacterium tumefaciens*) in plants on the study of human cancer [*R.A.M.*, xv, p. 205 *et passim*], the writer summarizes and briefly discusses a number of outstanding contributions to this problem under the headings of tumour emboli and metastases, tumour strands, location of bacteria in the host, and cytology of crown-gall tissue, a bibliography of 88 titles being appended.

Pichler (F.). **Saatgutbeizmittel.** [Seed-grain disinfectants.]—*Neuheiten PflSch.*, xxix, 5, pp. 181–183, 1936.

A list is given of the seed-grain disinfectants tested and recognized as efficacious in liquid or dry form against various fungal diseases by the Austrian Plant Protection Service [cf. *R.A.M.*, xiv, p. 518], among which may be mentioned the following steeps: agrostan supplied by Treibacher Chem. Werke, Vienna, for the control of wheat bunt [*Tilletia caries* and *T. foetens*], covered smut of barley [*Ustilago hordei*], and rye *Fusarium* [*Calonectria graminicola*]; cersolit (F. J. Kwizda, Korneuburg, near Vienna), Einheitsbeize-Kreidl (V. C. F. Kreidl, Heller & Co.), and fenoform (Aktienfabrik zur Erzeugung von Chemikalien, Neu-Erlaa) against wheat bunt (the two last-named also used as a sprinkle); and salvocer (Kreidl, Heller & Co.) against wheat bunt

(also as a sprinkle), *U. hordei* on barley, *C. graminicola* on rye, and loose smut of oats [*U. avenae*]. In dust form agrostan controls wheat bunt, covered smut of barley, and *C. graminicola* on rye; cersolit, Einheitsbeize-Kreidl, porzol [ibid., xiii, p. 11], salvocer, and tritisan (Vedepha, Vienna) are effective against wheat bunt; stripe disease of barley [*Helminthosporium gramineum*] may be combated by porzol; and *U. hordei* on barley and *C. graminicola* on rye by salvocer.

Sibilia (C.). **Ricerche sulle ruggini dei cereali. VI. La specializzazione della 'Puccinia graminis tritici' Erikss. et Henn. in Italia.** [Researches on cereal rusts. The specialization of *Puccinia graminis tritici* Erikss. & Henn. in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 95–98, 1936.

In June, 1935, the author made collections of *Puccinia graminis tritici* from wheat and *Berberis aetnensis* in three localities in Italy, inoculations with which on 12 wheat varieties showed them to consist of physiologic forms XL and XVII, the latter being the form found on *B. aetnensis*, a host restricted to a very few parts of Italy. McDonald's form K2 [*R.A.M.*, xv, p. 483] from Kenya is stated to be the same as form XVII.

Sibilia (C.). **La diffusione dei 'Berberis' in Italia in rapporto alla Puccinia graminis Pers.** [The distribution of *Berberis* in Italy in relation to *Puccinia graminis* Pers.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 139–145, 1936.

In connexion with his study of the physiologic forms of *Puccinia graminis tritici* [see preceding abstract] the author surveys in some detail the geographical distribution of *Berberis vulgaris* and *B. aetnensis* in Italy, where only these species of barberry are present. It would appear that while *B. vulgaris* is not uncommon, it is chiefly confined to northern Italy, the Alps, and the Appenines as far as the border of Tuscany. In central and southern Italy it is much less prevalent and increasingly gives place to *B. aetnensis*. In Sicily and Sardinia (and also in Corsica) only *B. aetnensis* occurs. In northern Italy, at least, the rust certainly overwinters partly on *B. vulgaris*, the climate being too cold to allow uredospores always to persist. In view of the abundance of this host on the Alps hitherto undescribed forms of the rust are expected to be present.

Sibilia (C.). **Ricerche sulle ruggini dei cereali. V. Ulteriori ricerche sulla specializzazione della 'Puccinia triticina' Erikss. in Italia.** [Researches on cereal rusts. V. Further researches on the specialization of *Puccinia triticina* Erikss. in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 69–75, 1 map, 1936.

In continuation of his studies of the physiologic forms of *Puccinia triticina* [*R.A.M.*, xv, p. 83; xvi, p. 25] the author during 1935–6 made 16 collections which inoculation tests on eight standard wheat varieties showed to consist of eight new physiologic forms and two already known, viz., forms XXV from Catanzaro, and LVIII from Borgo Velino and Barcellona (Messina). The new forms are numbered LXVII P to LXXIV P (the letter P indicating that the enumeration is provisional

and intended to stand only until the identity of the forms has been officially cleared up) and their distribution is clearly shown on a map. Most of these forms were of medium virulence, though LXIX P, the most virulent, was an exception, leaving only the Malakoff variety unaffected. The least virulent form was LXXIV P, which produced no pustules on the Malakoff, Webster, and Loros varieties, and only slight infection on Carina and Hussar wheats. The least virulent physiologic form of *P. triticina* in Italy is still form XV. Practically all the Italian forms produce no pustules on Malakoff (except LIX and LX) and show maximum infection on Bravit and Mediterranean wheats (except XV and LX). The only form so far found common to Europe and America appears to be XI. This work brings the number of physiologic forms of *P. triticina* found in Italy up to 18, of which only forms XV and XXV were previously known elsewhere. Forms LVIII and LXXIII P have both been found in widely separated localities.

WALDRON (L. R.). **The effect of leaf rust accompanied by heat upon yield, kernel weight, bushel weight, and protein content of hard red spring Wheat.**—*J. agric. Res.*, liii, 6, pp. 399–414, 1936.

A tabulated account is given of comparative studies in North Dakota of the effect of leaf [brown] rust (*Puccinia triticina*) on the yield of 20 selections each of four Ceres × (Hope × Florence) hybrid wheat families in 1934 and 1935; in both years the growing seasons were drier and hotter than normal, but in 1935 excessively hot weather was limited to the month of July, during which the average daily temperature was 2·7° F. above that in 1934. The maximum average infection for any family was only 13 per cent.

Of the four hybrid families studied, the one that exhibited a high degree of resistance to leaf rust and flecking maintained its yield in 1935, as compared with 1934, in spite of the excessive heat, whereas the second family, resistant to the rust but somewhat susceptible to flecking, showed in 1935 a loss in yield of 16 per cent., and the other two families, both of which were more susceptible to rust and to flecking, showed in comparison with 1934 losses of 19 and 28 per cent., respectively. These reductions in yield were shown to be mainly due to reduced size of the wheat grains (as judged by the weight of 1,000 grains), since almost no shrivelling of the grain was observed. Weights per bushel were also less in 1935 than in 1934, but the reduction was decidedly smaller than for yield and weight of 1,000 grains. The grain of the two families showing freedom from and resistance to leaf rust had a higher protein content in 1935 than in 1934, while the two susceptible families did not show any increase, clearly suggesting that the protein content was reduced by the presence of the rust.

FISCHER (G. W.). **The susceptibility of certain wild grasses to Tilletia tritici and Tilletia levis.**—*Phytopathology*, xxvi, 9, pp. 876–886, 3 figs., 1936.

Specimens of crested wheatgrass (*Agropyron cristatum*), in which practically every floret contained a bunt (*Tilletia tritici*) [*T. caries*] ball, have been found in field plantings in Washington and used as a source of inoculum for wheat. Hybrid 128 proved to be the most susceptible

of the nine winter wheat varieties tested, with 63·1 per cent. bunted heads, Turkey showing 8·53 per cent., and Ridit, Oro, Albit, Martin, Hohenheimer, White Odessa, and Hussar 2 per cent. and under [*R.A.M.*, xvi, p. 27]. Hard Federation, the only spring wheat tested, contracted 65 per cent. infection. On the basis of these varietal reactions the bunt collection from *A. cristatum* conforms to Bressman's physiologic form VIII [ibid., xi, p. 33] and Gaines's T_1 [ibid., xii, p. 617].

Of 22 selections of *A. cristatum* tested, 13 were more or less susceptible to *T. caries*, 6 to *T. levis* [*T. foetens*], and 3 to both, the corresponding figures for 25 strains of *A. pauciflorum* being 14, 5, and 5, respectively. *A. subsecundum* (*A. caninum*) was also susceptible to certain physiologic forms of both bunt species and *Hordeum nodosum* L. [*H. secalinum*] to *T. caries*.

GAUDINEAU (Mlle M.). **Le traitement des semences contre la carie du Blé.** [Seed treatment against Wheat bunt.]—*J. Agric. prat., Paris*, N.S., c, 39, pp. 221–222, 1936.

Wheat bunt [*Tilletia caries* and *T. foetens*] is stated to have been very prevalent in the Oise, Aisne, and Yonne districts of France in 1936, following a mild, damp winter, the stands chiefly affected (with an incidence of at least 20 per cent.) being those sown during the second fortnight of October. Directions for control by several approved methods are given [*R.A.M.*, xv, p. 638].

HAGBORG (W. A. F.). **Black chaff, a composite disease.**—*Canad. J. Res.*, xiv, 9, pp. 347–359, 1 pl., 1936.

The results of investigations from 1931 to 1934 showed that in Canada the condition of wheat previously referred to as black chaff [*R.A.M.*, xv, p. 489] really consists of three different types, the first characterized by water-soaked areas or by sharply delimited discoloration, chiefly confined to the chlorenchyma of the empty glumes, but sometimes also affecting the distal end of the lemmas and the upper part of the peduncles; the second by the fact that the margins of the discolorations are not sharply delimited but diffused throughout the tissues, chiefly of the lemmas, the florets being often sterile with the ovary and stamens frequently overgrown with mycelium; and the third by black discolorations (melanism) of the internodes. Isolations from the first type (for which the term bacterial black chaff is adopted) yielded numerous bacteria, the most prevalent of which conformed in its cultural characters with *Phytomonas* [*Bacterium*] *translucens* var. *undulosum* [loc. cit.], while *P.* [*Bact.*] *atrofaciens* [ibid., xiv, p. 297] was also occasionally present. Inoculation by smearing or spraying wheat seedlings with suspensions of *Bact. translucens* var. *undulosum* only gave a small percentage of successful infection, whereas 100 per cent. infection typical of black chaff was obtained by needle inoculations into the coleoptiles and enclosed primary leaves, and the organism was recovered from the lesions. Isolations from the second type consistently yielded a species of *Alternaria* resembling *A. tenuis*, which reproduced the condition when inoculated into healthy wheat seedlings. The third type failed to yield any pathogenic organism, and was experimentally

reproduced in Pentad × Marquis wheat (R.L. 723) by keeping the plants in moist chambers at about 25° for periods of from 36 to 60 hours, indicating that the condition is physiological in origin, and directly attributable to enclosure in the moist chamber since controls at the same temperature were unaffected.

STEVENS (H.). **The effect of latent infection on the smut-resistant Markton Oat**—*J. Amer. Soc. Agron.*, xxviii, 9, pp. 711–713, 1936.

Experiments conducted from 1932 to 1934 at Aberdeen, Idaho, showed that inoculation of the resistant Markton oats seed-grain with smut (chiefly *Ustilago levis* [*U. kolleri*] with a slight contamination of *U. avenae*) [*R.A.M.*, xv, pp. 642, 711, 712] results in the destruction of many seeds, thereby reducing the stand. After the plants emerge and become established, however, no detrimental effects are apparent. It is thus evident that a certain adverse influence is exerted by the disease even in the absence of obvious symptoms, but under normal field conditions smut is not likely to be a limiting factor in a resistant variety, which would produce practically no inoculum for the natural infection of the succeeding crop. The susceptible Idamine variety, used as a comparison in these tests, developed several abnormalities as a sequel to inoculation, including unusually small and irregular panicles and the extensive production of 'false nodes'.

GERRETSEN (F. C.). **Een onderzoek naar de oorzaken der Veenkoloniale Haverziekte.** [A study on the causes of grey speck of Oats.]—*Versl. RijkslandbProefst., 's Grav.* 42 (1), A, 67 pp., 17 pl., 1936. [German summary.]

The substance of the writer's investigations on the correlations between manganese deficiency, soil bacteria, and grey speck of oats [*R.A.M.*, xv, p. 791], a comprehensive, tabulated account of which is here presented, has already been noticed from another source [ibid., xv, p. 356].

VILKAITIS (V.). **Šiaudines Rugiu kūles.** [Stripe smut of Rye.]—*Yearb. agric. Acad. Dotnuva*, x, 2, pp. 131–141, 1 fig., 2 graphs, 1936. [Lithuanian, with German summary.]

Recent experiments in Lithuania are stated to have shown that the spores of stripe smut of rye (*Urocystis occulta*) [*R.A.M.*, xv, p. 644] survive the winter in the soil and retain their viability until the following spring. When spores of the fungus were strewn in the summer or autumn on the plots destined for spring planting the crop contained diseased haulms; in one test infection from this source amounted to 0·56 per cent. and in another to 0·4 and 0·7 per cent. The smutted haulms of the Svalöf's Star and Vierzbna varieties were up to 45 per cent. shorter than healthy ones, not owing to a reduction in the number of internodes, which in fact exceeded that of the sound plants by 14 per cent., but to the curtailment of the individual nodes, especially those of the ear. None of the eight varieties tested for their reaction to *U. occulta* showed any marked degree of resistance, the average incidence of infection in the three years' trials ranging from 10·77 (Dankow) to 34·86 per cent. (local selection), respectively.

FROMMHERZ (A.). **Die Bekämpfung der Ackerschnecke (Limax agrestis) und des Schneeschimmels (Fusarium nivale). Zwei gefährliche Feinde der jungen Roggensaat.** [The control of the common slug (*Limax agrestis*) and of the snow mould (*Fusarium nivale*), two dangerous pests of young Rye seed.]—*Dtsch. landw. Pr.*, lxiii, 37, p. 466; 38, p. 478, 1936.

Recommendations are made for combating snow mould of rye (*Fusarium nivale*) [*Calonectria graminicola*] in Baden, Germany, by judicious cultural measures, such as the selection of open sites (avoiding a northerly exposure), sparing use of nitrogen, and the planting of the rye following potatoes or some other root crop. The widely grown Petkus variety is equally susceptible to *C. graminicola* with other cultivated types, whereas the local forms, though liable to infection, rapidly recover from its effects [cf. *R.A.M.*, xv, p. 644]. Among meadow grasses soft grass [*Holcus lanatus*] suffers particularly heavy damage from snow mould. Seed-grain disinfection is essential, and it is also advisable to break up and accelerate the thawing of the snow cover by harrowing and strewing over the ground a warmth-promoting fertilizer, e.g., potash salt, calcium cyanamide, or basic slag [ibid., xv, p. 434].

COOK (M. T.). **Phloem necrosis in the stripe disease of Corn.**—*J. Agric. P.R.*, xx, 3, pp. 685–688, 2 pl., 1936.

Examination of maize affected with white stripe disease [*R.A.M.*, xiv, p. 93 and below, p. 114] in Porto Rico showed phloem necrosis to be invariably present, accompanied by a thickening of the walls of the epidermal cells, fibrous cells, and sheath. The chloroplasts in the cells of healthy plants were larger than those in the chlorotic parts of affected plants and in severely affected regions the nuclei showed disintegration.

REED (H. S.) & PARKER (E. R.). **Specific effects of zinc applications on leaves and twigs of Orange trees affected with mottle-leaf.**—*J. agric. Res.*, liii, 5, pp. 395–398, 1 fig., 1936.

In an experiment near Riverside, California, Valencia orange trees severely affected with mottle leaf [*R.A.M.*, xv, p. 714] were sprayed in 1934, shortly before the appearance of the first cycle of growth, with zinc sulphate and hydrated lime (10–5–100), and another batch was similarly treated in October. The first trees began to improve in a few weeks and the second lot showed normal growth in the following spring. As illustrating the effects of the zinc spray, it is stated that the mean areas of the small leaves of the cycle of growth immediately preceding the treatment were 0·74 and 0·75 sq. in. for the untreated and the sprayed trees, respectively; whereas the corresponding measurements for leaves formed in late summer or autumn were 1·61 and 3·67 sq. in. Other effects observed were the longer internodes and thicker xylem cylinder in the twigs from the sprayed trees.

HAAS (A. R. C.). **Zinc relation in mottle-leaf of Citrus.**—*Bot. Gaz.*, xcviii, 1, pp. 65–86, 7 figs., 1936.

When healthy and mottled Valencia orange leaves [see preceding abstract] were dipped in a mixture of zinc sulphate (100 gm.), calcium

hydrate (50 gm.) and blood albumin spreader (tr.) in 1 l. distilled water and grown in rooting chambers with other undipped leaves, 28 per cent. of the healthy, treated leaves and 20 per cent. of the healthy controls rooted. Thirty per cent. of the mottled, treated leaves rooted as against only 6 per cent. in the controls. The average fresh weights of the root systems of the mottled orange leaves, treated and untreated, were greater than those of corresponding healthy leaves. Of healthy lemon leaf cuttings dipped in the mixture 52 per cent. rooted, compared with 26 per cent. for the untreated. The zinc treatment did not benefit, however, mottled lemon leaves which rooted at least as readily as the healthy ones. The leaves of mottled Valencia leafy twig cuttings had a smaller fresh weight, but produced a heavier root system than the leaves of healthy cuttings, and treatment of the mottled cuttings increased the weight of fresh roots per gram of fresh leaves. The untreated, rooted mottled orange leafy twig cuttings contained greater percentages of sucrose than the corresponding parts of healthy cuttings; the zinc treatment reduced the sucrose percentages present in the leaves and roots at the end of the experiment. The dry matter of mottled orange leaves grown in the field contained slightly greater percentages of reducing and total sugars than that of healthy leaves, and this increased sugar assists recovery when the limiting condition is corrected. The evidence obtained showed that the variations frequently observed in the rate of response to zinc treatment may be due partly to its temporarily retarding effect on growth.

Mottle leaf was produced in Valencia rooted leafy-twig cuttings grown in culture solutions lacking zinc. When the zinc concentration of the culture solution was high the addition of aluminium improved growth. In sand or soil cultures an excess of urea induced chlorosis and little leaf, the severity being regulated by the amount and frequency of the applications.

Bouhelier (R.) & Berger (G.). **Essais et observations sur l'oléocellosis des Agrumes.** [Experiments and observations on Citrus oleocellosis.]—*Rev. maroc. Fruits Primeurs*, vi, 6, p. 209–211, 2 figs., 1936.

Citrus fruits in Morocco commonly show very irregular, superficial lesions, and a spotting closely resembling oleocellosis [*R.A.M.*, xiv, p. 755]. In experiments on the latter condition commercial orange oil was dropped on to green oranges attached to the tree, and left on indefinitely or wiped off after varying periods. In all cases, a spot rapidly appeared where the drop fell, distinctness increasing with the duration of contact. Spotting also developed on ripe oranges where oil had been dropped 24 hours after picking and left in contact for 15 minutes or more. Lemons again showed similar results. Pricking the fruit (green and ripe) with a fine needle liberated the oil and led to the formation of spots. It is concluded that essential oil is the chief, if not the only, cause of the spotting.

Bitancourt (A. A.) & Jenkins (Anna E.). **Perfect stage of the Sweet Orange fruit scab fungus.**—*Mycologia*, xxviii, 5, pp. 489–492, 1 pl., 1 fig., 1936.

The authors state that the perfect stage of the sweet orange fruit

scab fungus (*Sphaceloma fawcettii viscosa*) [*R.A.M.*, xv, p. 362] was found in 1936 on a fruit of the Bahia Navel orange (*Citrus sinensis*) from San Paulo. Ascomata in all stages of development were present on a limited number of lesions; they were globose or nearly so, in contrast to the more scanty, flattened ascomata of *Elsinoe fawcetti* [ibid., xv, p. 575], occasionally confluent, buff, 40 to 120 μ [100 μ in the Latin description] in diameter, with a well-developed hyaline or slightly yellowish pseudoparenchyma devoid of a well-defined epithecium. The asci are globose to obclavate, with the inner wall thickened apically, and 15 to 27 by 13 to 21 μ; the ascospores are hyaline, variable, straight or more or less curved, 2- to 4-celled, often markedly constricted not only at the median septum but also at the other two, sometimes with a longitudinal septum in the upper middle cell, which is frequently slightly larger than the other cells; they are larger (12 to 20 by 4 to 8 μ) than those of *E. fawcetti*. The morphological differences indicated are believed to warrant the separation of the variety *viscosa* from *E. fawcetti* and its erection into a distinct species, for which the name *E. australis* n.sp. is suggested. The conidial stage is correspondingly renamed *S. australis* Bitancourt & Jenkins.

PATEL (J. S.) & NAYAR (A. P. B.). **Natural and induced resistance to shoot-rot in the Coconut.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 432–437, 1936.

Observations made from 1925 to 1934 on 26 coco-nut varieties from different parts of the world grown at Pilicode Research Station, Madras, showed that none was immune from the shoot rot disease attributed by Sundararaman to *Gloeosporium* sp. [*R.A.M.*, ix, p. 88]; the percentage of infection ranged from 37 in a variety from the Philippines up to 87 in one from Mysore. Trees from 3 to 9 years old were most susceptible, and susceptibility was more pronounced in trees planted on the surface of the soil than in those planted at a depth of 3 ft. Resistance was increased considerably by soil applications of potassium sulphate and slightly by liming.

CELINO (M. S.). **Diseases of Cotton in the Philippines: I. Sclerotium stem rot, with notes on other diseases.**—*Philipp. Agric.*, xxv, 4, pp. 302–320, 6 figs., 1936.

In 1935 cotton growing in the Philippine Islands was attacked by *Sclerotium rolfsii* [*R.A.M.*, xi, p. 298; xiv, pp. 125, 223], locally a new record on this host. Infection usually occurred on the stem, at or just below ground-level, and the bark in the affected part turned reddish-brown, shrank slightly, and decayed. The rot developed round the stem and passed upwards to a distance of a few centimetres, and in severe cases infection might reach the woody part of the stem. The death of the plant at the base was followed by wilting of the leaves, the stem sometimes snapping. Seedlings and young plants were specially susceptible.

Inoculations of the uninjured stems of cotton seedlings and cotton seeds gave positive results under damp conditions, some of the former plants recovering, recovery being hastened by exposure to sunlight. Infection was rare when mature plants were inoculated. Cross-inocula-

tions showed that the cotton strain also attacked *Musa textilis*, egg-plant, lettuce, groundnut, soy-bean, tomato, and rice, while strains from the five first-named infected cotton. In cultures aversion was strongly manifested between the cotton organism and strains of *S. rolfsii* from other hosts, though the cotton and soy-bean strains appeared to be the same.

The disease was greatly reduced by soil sterilization. The most practical method of control consists in the prompt removal and burning of all affected parts and the soil in their immediate vicinity. If the attack is severe the plants should be sprayed with a fungicide.

Among other diseases of cotton observed was a dry rot of the flowers and bolls constantly associated with a *Fusarium*. A seedling stem rot was associated with *F. moniliforme* [*Gibberella moniliformis*], *F. solani* var. *eumartii*, and a *Rhizoctonia*. Anthracnose [*Glomerella gossypii*: ibid., xiv, p. 755] attacked all varieties at the Agricultural College. *Schizophyllum commune* [see below, p. 106] was found on cotton bolls which become hard or mummified, and areolate mildew (*Ramularia* [*Mycosphaerella*] *areola* [ibid., xi, p. 512]) was recorded for the first time from the Philippines.

VASUDEVA (R. S.). **Studies on the root disease of Cotton in the Punjab. II. Some studies in the physiology of the causal fungi.**—*Indian J. agric. Sci.*, vi, 4, pp. 904–916, 2 graphs, 1936.

Further studies on the cotton root rot caused in the Punjab mainly by *Rhizoctonia bataticola* [*Macrophomina phaseoli*] and *R.* [*Corticium*] *solani* [*R.A.M.*, xv, p. 148] showed that both fungi grew best in culture on a synthetic agar (containing glucose, peptone, and inorganic salts) the composition of which was based on chemical analysis of the cotton roots themselves. Both grew fairly rapidly, optimum growth occurring at 30° C.; above this, the growth rate fell, ceasing at 40° on all media except Brown's agar, on which *M. phaseoli* showed slight growth at this temperature. When grown on similar synthetic solutions each lacking in one constituent, the omission of magnesium and sodium salts had little effect on either fungus, whereas in the absence of iron salts growth was improved. The omission of phosphate or sugar reduced the vigour of growth, and in the absence of peptone, growth was reduced to a minimum, taking the form of a thin, scanty film. Both fungi tended to change the reaction of the medium, and in all cases reduced the acidity of the solutions. Both tolerated a wide range of acidity and alkalinity (P_H 2·4 to 9·2), making fairly good growth between P_H 3·2 and 8·5, with the optimum near neutrality. When grown on Richards's agar in a carbon dioxide concentration of 25 per cent., both showed marked reduction of growth. *C. solani* failed to grow when exposed to a temperature of 60° for 5 seconds, but an exposure of 5 seconds to 68° was required to kill *M. phaseoli*; both withstood a temperature of 0°.

Experimental evidence showed that the parasitic activity of *C. solani* was enhanced when it acted in combination with other fungi associated with the root disease (*Fusarium solani*, two other strains of *Fusarium*, and *Helminthosporium* sp.), whereas when *M. phaseoli* was used in combination with species of *Fusarium*, *Helminthosporium*, and *Alternaria* no significant difference in parasitic activity resulted. Mixed

inoculations with *C. solani* and *M. phaseoli* tended to increase the virulence of each.

AMBEGAOKAR (K. N.) & WAD (Y. D.). **Studies in disease resistance. I. Cotton wilt and environment.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 502–526, 1 col. pl., 2 graphs, 1936.

A study of the behaviour of *Fusarium* [*vasinfectum*] causing cotton wilt in India [*R.A.M.*, xv, p. 799] under controlled laboratory conditions and in the field showed that actual wilting was not due to insufficient soil moisture. The root death rate of wilted plants always exceeded the fresh production of active roots in the upper 18 in. of soil and this reduced root activity was reflected in reduced yields. Incidence was affected by changes in nutrient, but this influence was modified by soil conditions and varietal requirements. Though nitrogenous manures sometimes appeared to increase incidence, the leaves of wilted plants always contained less nitrogen than healthy ones. In general, potash deficiency of the leaves in relation to lime was associated with wilt, while the susceptible Malvi also showed a deficiency of magnesia. The apparent association of an abrupt increase in sunlight duration with increased incidence may be connected with low nitrogen content, sudden increase in photosynthesis producing exhaustion of the vital proteins.

THADANI (K. I.). **Some notes of the incidence of disease and resistance to pathological and other adverse conditions in crops of Sind.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 470–480, 1936.

In the course of plant breeding work at Sind it was observed that most of the imported American cotton varieties possessing leathery, glabrous leaves are susceptible to red leaf [*R.A.M.*, xv, p. 717], but strains 289 F-1 and 4 F-98 derived from Sind American cotton varieties are very resistant. The Egyptian and Sea Island cotton varieties tested in Sind show 'leaf crinkle', but three improved strains, viz., Ashmouni 37, Boss III-16, and Sea Island 2-4 have been produced, and can be grown successfully in Lower Sind.

In 1932–3, two late-maturing sorghum varieties, Bagdar No. 1 and Saoro Kartubo No. 1, were badly affected by long smut (*Tolyposporium filiferum*) [*T. ehrenbergii*: ibid., xiii, p. 300] in plots sown on 30th June, but were comparatively unaffected in plots sown between 7th and 12th June. All the varieties that flowered before the third week of August appeared to be unaffected. Similar observations were again made a year later.

Rice brown spot (*Helminthosporium oryzae*) [*Leptosphaeria salvinii*: ibid., xv, p. 740] was most severe in Sind on late varieties, in low-lying, shady areas, and under humid conditions with low temperatures. Promising results in control were given by the development of resistant varieties.

RAO (I. M.) & WAD (Y. D.). **Studies in disease resistance. II. Leaf-roll and red leaf of American Cottons.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 535–551, 2 col. pl., 2 figs., 1936.

Pot culture experiments [which are described] indicated that the 'leaf roll and red leaf' disease of American cotton varieties [see preceding

abstract] may develop if the soil surface becomes puddled after prolonged saturation. The disease could invariably be produced by deflocculation of even an inch of surface soil, either by chemical or mechanical means. The death rate of the roots of diseased plants was abnormally high and this led to disturbance of the growth balance, as shown by the lower sap concentration and nitrogen content of diseased leaves. The disease has been prevented by applications of farmyard manure or compost and in pot cultures soils treated with nitrogen yielded plants free from disease. The authors conclude that the deciding factor favouring the disease appeared to be soil deterioration during the crop season and state that appropriate treatment of the soil promises to overcome the malady.

PRINDLE (B.). **Microbiology of textile fibres. V. Method for the general histological examination of normal or mildewed Cotton fibres.**—*Text. Research*, vi, 11, pp. 481–487, 8 figs., 1936.

Details are given of a method for the detection and observation of changes in the histological structure of cotton fibres in the course of mildew development [cf. *R.A.M.*, xv, p. 18]. The fibre elements are first stained in a 0·15 per cent. solution of Victoria Blue B, boiled for one minute, washed in cold water, boiled in fresh distilled, again rinsed in cold, and finally subjected to swelling in a cuprammonium solution containing not more than 0·8 per cent. copper. The normal fibres will then be found to present a beaded appearance due to bulging of the swollen cellulose of the secondary wall between constricting collars of resistant cuticle, whereas the mildewed elements swell more readily and evenly. The outstanding advantage of this technique, however, consists in the ease with which the state of the material in the lumen of the fibres and the cuticle may be observed.

RENNERFELT (E.). **Untersuchungen über die Entwicklung und Biologie des Krebspestpilzes Aphanomyces astaci, Schikora.** [Studies on the development and biology of the Crab fungus, *Aphanomyces astaci* Schikora.]—*Medd. Undersökn. o. Försöksanst. Söttvattensfisk., Stockh.*, 10, 21 pp., 2 figs., 1936. [Swedish summary.]

Aphanomyces astaci, the agent of a severe parasitic disease of fresh-water crabs (*Astacus fluviatilis*) in Sweden, was isolated from the ventral chain of ganglia of infected individuals and grown in pure culture on blood (crab, fish, and animal) agar. It is characterized by a branched mycelium, 7·5 to 9·5 μ in diameter, undifferentiated zoosporangia of the same dimensions, zoospores 8·1 to 9·5 μ in diameter, forming a group at the top of the empty sporangium, each giving rise to an elliptical, biciliate swarm spore, globular, echinulate oogonia, 41·6 to 48 μ in diameter, borne terminally on short branches, oospores 22·4 to 28·8 μ in diameter, and occasional androgynous antheridia. The strongly parasitic tendency of *Aphanomyces astaci* was shown in these experiments by its inability to grow on vegetable substrata.

The optimum temperature for the development of *A. astaci* was found to be about 20° C., but good growth takes place throughout the range from 10° to 25°; the minimum is below 5° and the maximum round about 30°; the mycelium of the fungus was killed by twelve

hours' freezing. These relationships explain the virulent character of the summer epidemics of the disease. An acid reaction is more favourable to the development of *A. astaci* than an alkaline one, especially as regards zoospore production, which declined to a minimum at P_H 8·4 and above.

At concentrations of 0·001 per cent., copper sulphate and mercuric chloride inhibit mycelial development in the crab fungus, to which chlorine (7·5 mg. per l.) is also highly toxic. The mycelium does not survive desiccation, but the results of experiments on its viability under different conditions suggest that it may well be carried from lake to lake on nets or other tackle to which fish blood, glue, or any organic substance adheres.

NEGRONI (P.). **Étude de la capsule de Mycotorula albicans (Ch. Robin, 1853).** [A study of the capsule of *Mycotorula albicans* (Ch. Robin, 1853).]—*Ann. Parasit. hum. comp.*, xiv, 5, pp. 511–516, 1936.

An account of this study on the capsule of *Mycotorula* [*Candida*] *albicans* has already been noticed from another source [*R.A.M.*, xv, p. 221].

HOPKINS (E. W.) & HESSELTINE (H. C.). **Reliability of fermentation tests in identification of the Monilias.**—*J. Lab. clin. Med.*, xxi, 11, pp. 1105–1113, 1936.

Eleven strains of *Monilia* isolated from cases of vulvovaginitis and oral thrush [*R.A.M.*, xii, p. 370] retained the same fermentation characters for periods of six to eight months after isolation. In some instances a large amount of inoculum induced fermentation when a small one failed to do so. A comparison of the fermentation data for the three types recognized by Stovall and Bubolz [ibid., xii, p. 691; xiv, p. 34] (*M.* [*Candida*] *parapsilosis*, *M.* [*C.*] *albicans*, and *M. candida* [*C. vulgaris*]) revealed considerable unanimity. In general, the fermentation rates of *Monilia* differ sufficiently to permit separation into groups. Morphological studies are indicated in the case of occasional strains giving variable fermentation reactions.

MARTIN (D. S.), BAKER (R. D.), & CONANT (N. F.). **A case of verrucous dermatitis caused by Hormodendrum pedrosoi (chromoblastomycosis) in North Carolina.**—*Amer. J. trop. Med.*, xvi, 5, pp. 593–619, 5 pl., 1936.

From a case of verrucose dermatitis (chromoblastomycosis) affecting the left hand and arm of a negro the authors isolated *Hormodendrum pedrosoi* [*R.A.M.*, xvi, p. 38], the first record of the fungus in the United States. Several types of conidial formation were observed in cultures. A *Hormodendrum* type was present, with spores, 3 to 6 by 1·5 to 3 μ, connected into branching chains by 'disjunctors' [pads], 0·5 μ thick, which remained attached to the spores after the chain was broken. *Acrotheca*-like spore heads also occurred. Tooth-like processes appeared on the apical portion of the terminal cell of some of the conidiophores, and as spores developed terminally on these structures, other similar processes were formed pleurogenously. *Acrotheca*-like spore heads also developed on typical *Hormodendrum* conidiophores. The *Phialophora*

type of reproduction described by Carrión and Emmons [loc. cit.] in cultures of *H. pedrosoi* was also noted. Clusters of ovoid spores 1·5 to 2 by 0·5 to 1 μ were borne in cups on flask-shaped conidiophores which appeared singly (or in groups of two or more) along the hyphae or terminally. All three types occurred in single-spore cultures.

MARTIN (D. S.) & SMITH (D. T.). **The laboratory diagnosis of blastomycosis.**—*J. Lab. clin. Med.*, xxi, 12, pp. 1289–1296, 4 figs., 1936.

The laboratory procedures of value in the diagnosis of blastomycosis (*Blastomyces* [*Endomyces*] *dermatitidis*) [*R.A.M.*, xv, p. 722] are described in detail and include the examination of sputum, isolation of the fungus on blood agar or Sabouraud's dextrose agar, purification of isolations by transfers of aerial hyphae clipped off by scissors, and complement-fixation tests.

IVANIĆ (M.). **Über den Bläschenkernbau und die promitotische Kernteilung eines im menschlichen Enddarme lebenden Pilzes (Blastocystis hominis Brumpt).** [On the vesicular nuclear structure and the promitotic nuclear division of a fungus occupying the human rectum (*Blastocystis hominis* Brumpt).]—*Arch. Protistenk.*, lxxxvii, 2, pp. 242–247, 14 figs., 1936.

The author has followed cytologically the stages of development of *Blastocystis hominis* [*R.A.M.*, xv, p. 94], an extremely widespread occupant of the human rectum in Bulgaria, and here presents in detail the results of his observations.

HRUSZEK (H.). **Sur l'irréversibilité du pléomorphisme des dermatophytes (inoculation chez l'homme).** [On the irreversibility of pleomorphism in dermatophytes (inoculation into man).]—*Ann. Parasit. hum. comp.*, xiv, 5, pp. 517–518, 1936.

Squamae produced on the author's skin after inoculation with a pleomorphic culture of *Achorion gypseum* [*R.A.M.*, xv, p. 651] several months old were seen to contain a few short, non-septate hyphae but no spores, and on re-isolation yielded a purely pleomorphic culture of the same fungus. This fact is considered to militate in favour of the view of the stability and irreversibility of downy degeneration in ringworm fungi.

KITTREDGE (H. E.). **Onychomycosis universalis trichophytina et epidermophyta : report of the seventh case thus far recorded in English.**—*Arch. Derm. Syph., Chicago*, xxxiv, 3, pp. 398–410, 2 figs., 1936.

In connexion with the report of a case of onychomycosis universalis, the agent of which was tentatively identified by Weidman as *Trichophyton purpureum* [*R.A.M.*, xv, p. 500], the author reviews the previous six instances and critically discusses the available information as to the rôle of certain habitual saprophytes in the etiology of the condition.

SUZUKI (S.). **Über Trichophytie und ihre Erreger auf der Miura-Halbinsel, und ein Beitrag zur Kenntnis der Achorion gypseum Bodin (1907).** [On trichophytosis and its agents on the Miura peninsula, and a contribution to the knowledge of *Achorion gypseum* Bodin (1907).]—*Jap. J. Derm. Urol.*, xl, 2, pp. 86–87, 1936.

One hundred cases of trichophytosis, yielding 31 fungal cultures, were

detected in the course of an inspection of five national schools and a factory on the Miura peninsula, Japan, the following organisms being involved: *Trichophyton violaceum* (3), *T. glabrum* (1), *T. purpureum* (12) [see preceding abstract], *T. interdigitale* (10), *T. gypseum asteroides* [*T. mentagrophytes*] (1), and *Achorion gypseum* (4). Particular interest is attached to the last-named [*R.A.M.*, xv, pp. 501, 651], isolated from three children and one adult; it grew rapidly on Sabouraud's medium, forming a dry, white, flocculent colony with a circular, pulverulent, rusty-brown zone round the central umbo, and bearing a profusion of plurilocular (mostly 5 to 6) spindles. Positive results were obtained in inoculation experiments on guinea-pigs and hens, while the fungus also penetrated the leaf tissues of *Rohdea japonica*.

DÓSA (A.). **Mikrosporon felineum und Mikrosporon fulvum an Hand von 'Herpes tonsurans erythematosquamosus'- bzw. 'Herpes tonsurans'-Fällen.** [*Microsporon felineum* and *Microsporon fulvum* in association, respectively, with cases of herpes tonsurans erythematosquamosus and herpes tonsurans.]—*Derm. Wschr.*, ciii, 38, pp. 1281–1284, 4 figs., 1936.

The differences between *Microsporon felineum* and *M. fulvum* [*R.A.M.* xv, p. 440], the former isolated from a case of herpes tonsurans erythematosquamosus in a 25-year-old woman and the latter from herpes tonsurans in a nine-year-old child at Szeged, Hungary, are considered insufficient to warrant the separation of these two species, which the author proposes to unite under the name of '*M. felineofulvum*'.

RIDDET (W.) & NEILL (J. C.). **Butter-boxes and mould-growth.**—*N.Z. J. Agric.*, liii, 3, pp. 129–139, 7 figs., 1936.

Experiments carried out in New Zealand showed that moulds (*Pullularia pullulans*, *Cladosporium herbarum*, *Penicillium expansum*, *Mucor* sp., and a red-staining type) originating in butter boxes may infect the surface layer of butter packed therein, and cause extensive damage [*R.A.M.*, xiv, p. 762]. Mould growth on the boxes was stimulated by defrosting the butter at high atmospheric temperature in air of high humidity, by admitting air to the inner surface of the box, and by the use of sap wood in place of heart wood and of rotary-cut instead of sawn timber. Standard, ⅜ in. sawn saranac (wire-bound), sub-standard, and ¼ in. sawn saranac boxes made of white pine [*Podocarpus dacrydioides*] did not readily develop moulds, but were increasingly susceptible in the order given. The 'springing' of the sides away from the ends of saranac boxes during handling and the consequent admission of air stimulated mould growth. Swedish pine impregnated with wax was less susceptible than white pine, but imparted a taint to the butter. Immersion of the timber in 0·1 per cent. sodium salicylanilide (Shirlan W.S.) solution for 10 minutes gave very promising results in preventing infection. Aluminium foil between two sheets of parchment paper besides other advantages successfully prevented moulds from reaching the butter from the inner surfaces of the boxes. It is concluded that the ⅜ in. sawn saranac container is probably the best type for export purposes,

MOLENAAR (F. A. P.). **Magnesium in verband met ziekteverschijnselen bij cultuurgewassen.** [Magnesium in relation to pathological symptoms in cultivated plants.]—*Landbouwk. Tijdschr., Wageningen*, xlviii, 590, pp. 637–638, 1936.

In 1931 the writer applied to some abacá (*Musa textilis*) plants in Sumatra showing symptoms somewhat resembling those of bunchy top in the Philippines [*R.A.M.*, xiv, p. 37] ½ to 1 kg. magnesium sulphate per stool (equivalent to between 500 and 1,000 kg. per hect.), which resulted in a marked improvement within a month, the leaves resuming their normal dark green colour and gradually starting to make vigorous growth. The disorder is thought to have been due to magnesium deficiency, a common trouble in soils with an inadequate lime supply, such as the old liparite-tufas on which these abacá stands were planted.

TILFORD (P. E.). **Fasciation of Sweet Peas caused by Phytomonas fascians n.sp.**—*J. agric. Res.*, liii, 5, pp. 383–394, 2 figs., 1936.

An amplified account is given of the writer's investigations on fasciation of winter-flowering sweet peas in Ohio [*R.A.M.*, xiv, p. 365; xv, p. 723]. The disorder is caused by a hitherto undescribed bacterium which is named *Phytomonas fascians* n.sp. It is a non-motile, aerobic, non-sporulating, Gram-positive, non-acid-fast rod, 1·5 to 4 μ long by 0·5 to 0·9 μ in diameter (average 2·7 by 0·69 μ). It has no diastatic action, does not liquefy gelatine, reduces litmus in the bottom of the tubes, produces hydrogen sulphide and ammonia, reduces nitrates, and does not form indol. On potato dextrose agar it forms cadmium yellow to deep chrome or orange-buff colonies, and in broth produces a slight turbidity with sediment and a thin, fragile pellicle with a rim on the surface. It grows at temperatures from 7° to 35° C., with an optimum between 25° and 28°; thermal death point between 55° and 57° with 10 minutes' exposure. It retained its virulence in potato dextrose agar culture for over 18 months.

The bacterium was experimentally shown to be pathogenic to all the varieties of sweet peas tested, and to garden peas, petunias [*Petunia hybrida*], geraniums [*Pelargonium*], tobacco, and *Gypsophila paniculata* plants. It has also been isolated from fasciated growths on a chrysanthemum received from New Jersey.

WARE (W. M.). **Alternaria leaf-spot of Stock (Matthiola).**—*Gdnrs' Chron.*, c, 2596, pp. 236–237, 3 figs., 1936.

An account is given of a disease affecting the foliage of Ten-week and Early-flowering Harbinger stocks (*Matthiola*) [*incana* var. *annua*] in a greenhouse at Ashford, Kent, in 1935. The symptoms, which were confined to the lower leaves, consisted of pale greyish-green, slightly depressed, dry lesions, 3 to 10 mm. in diameter, and a marked tendency to collapse due to lack of rigidity of the mid-rib. Many leaves also bore dark brown to nearly black, concentric spots, on which were produced an abundance of concatenate, 2- to 14-septate, greyish-green conidia, 30 to 140 by 12 to 24 μ (average 86 by 18 μ), frequently showing a scar, 2 to 3 μ in length, at either extremity marking the place of attachment to the conidiophore (50 to 140 by 3 to 6 μ) or to the next spore in the

chain. The fungus was tentatively identified by S. P. Wiltshire with a parasite of *Brassica chinensis* and other crucifers in Japan recorded by Yoshii as *Alternaria brassicae* (Berk.) Sacc. var. *macrospora* Sacc. [*R.A.M.*, xiii, p. 3] but for which there does not appear to be a legitimate name. The origin of the disease, which is new to Great Britain, is unknown. The removal of the infected leaves was partially successful in controlling the disease.

HARRIS (M. R.). **A Coniothyrium disease of Peonies.**—*Plant Dis. Reptr*, xx, 15, pp. 236–238, 1936. [Mimeographed.]

A rapid wilting and killing of the flower stems of tree peonies (*Paeonia mootan*) as a result of basal girdling of the stem by *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xvi, p. 47] is recorded from the San Francisco Bay region, Sacramento and Santa Clara, California. Inoculations through wounds or by spraying the growing tips with a spore suspension gave positive results on *P. mootan* and *P. albiflora* (not a natural host). Control measures based on plant sanitation methods and spraying with 3–3–50 Bordeaux mixture are recommended.

LAMBERT (E. B.) & CRANDALL (B. S.). **A seedling wilt of Black Locust caused by Phytophthora parasitica.**—*J. agric. Res.*, liii, 6, pp. 467–476, 3 figs., 1936.

An account is given of a serious wilt of black locust (*Robinia pseudacacia*) seedlings, which was first noticed in 1933 in a nursery of Virginia, and which has since been found also to occur in a few nurseries in North Carolina and Alabama. Isolations from diseased material yielded a typical strain of *Phytophthora parasitica* (as identified by C. M. Tucker), the pathogenicity of which to black locust seedlings was experimentally demonstrated. The most severe damage in the nurseries was done to seedlings one to three weeks old, the first noticeable symptom being a slight drooping or curling of the cotyledons, followed by the sudden wilting and collapse of the entire upper portion of the seedling, which often completely disintegrates in four to five days. Seedlings over four weeks old occasionally may exhibit a very similar wilting, but the disease is then clearly not systemic and is rarely fatal. Experimentally the disease was induced in healthy seedlings by spraying them with swarm spores of the fungus, and also by inoculating the soil with cultures. There was also evidence that the liberation of swarm spores, encystment, germination, and penetration of the host tissues all take place in four hours under favourable environmental conditions. In the greenhouse and in field plots the wilt was controlled by acidifying the soil to a P_H value of 4·6 or by spraying the seedlings with 4–6–50 Bordeaux mixture.

WEIMER (J. L.). **Alfalfa dwarf, a virus disease transmissible by grafting.**—*J. agric. Res.*, liii, 5, pp. 333–347, 3 figs., 1936.

The results of the work reported in this paper showed that the dwarf disease of lucerne [*R.A.M.*, xiii, p. 241] is neither due to unfavourable soil conditions, nor to a fungus; numerous bacteria were isolated from at least 75 per cent. of the diseased roots studied, but none proved to

itself, but in some experiments infection appeared to spread from pieces of diseased roots placed in the soil though not from pieces of diseased stems. The disease spreads readily from affected to adjacent healthy plants, and water, not an important factor in dissemination of the causal agent, may yet play a part in transporting living root tissue or possibly in carrying an insect vector. Stem cuttings from diseased plants produced from 35 to 80 per cent. of dwarfed plants. The disease was not transmitted by the leaf or needle inoculation of diseased sap, or by inserting bits of diseased tissue into healthy plants, except when yellow wood of the root or crown was used, and even then the percentage of infection was very small (except in one case in which 84 per cent. infection was obtained). A high percentage of infection was, however, obtained by successful approach grafting of a diseased root on a healthy one, or *vice versa*. These data indicate that lucerne dwarf is a virus disease transmissible by grafting but not by juice inoculation.

WIANT (J. S.) & STARR (G. H.). **Field studies on the bacterial wilt of Alfalfa.**—*Bull. Wyo. agric. Exp. Sta.* 214, 20 pp., 4 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 4, pp. 501, 1936.]

Most of the reductions in the lucerne yield in Wyoming have been found to be due to a gradual depletion of the stands by the widespread *Phytomonas insidiosa* [*Aplanobacter insidiosum*: *R.A.M.*, x, p. 602; xv, p. 559]. No correlation has been observed between bacterial wilt and either available soil phosphorus or soluble salts, but a rise in the incidence of the disease is constantly associated with higher percentages of plants suffering from winter injury. The cultivation of resistant varieties seems to be the sole practicable control measure.

YARWOOD (C. E.). **The tolerance of Erysiphe polygoni and certain other powdery mildews to low humidity.**—*Phytopathology*, xxvi, 9, pp. 845–859, 1936.

At favourable temperatures conidia of *Erysiphe polygoni* from red clover [*Trifolium pratense*: *R.A.M.*, xv, p. 659] and bean [*Phaseolus vulgaris*: ibid., xiv, p. 207] germinated well at relative humidities from 100 down to approximately 0 per cent., but both germinated and non-germinated spores were soon shrivelled and killed at the lower values. The adverse effects of low humidity were increased at high temperatures.

Conidia of *E. polygoni* and those of *E. graminis* from barley [ibid., xv, p. 568] retained their turgidity at 80 per cent. relative humidity, though decreasing considerably more in volume than those kept at 100 per cent. or floating on water during germination. On the other hand, conidia of *Colletotrichum trifolii* [ibid., xiii, p. 773], *Sclerotinia fructicola*, and *Cicinnobolus cesatii* [ibid., xiii, p. 774] did not germinate without free water and increased greatly in volume during the process.

The clover mildew mycelium made good growth at 100 per cent. relative humidity and temperatures up to 27° C. but at 0 per cent. relative humidity growth was rather less and in two tests none at all occurred at 25° and 27°. Infection with the powdery mildews of clover, bean, cabbage [ibid., xv, p. 659], *Delphinium* [ibid., xiii, p. 460],

cichoracearum) [ibid., xiii, p. 286; xvi, p. 13] was successful at the lowest relative humidities tested (25 to 55 per cent.).

Conidiophores of bean and mustard mildew were destroyed by heavy rain, and conidial dissemination was severely checked by rain in both these organisms, as well as in clover mildew, while the pea mildew [also *E. polygoni*: ibid., xiv, p. 287], as well as that of beans, was injured or killed by atomizing the diseased foliage with water.

SAHAYA (C. B.). **A disease of Cyperus tegetiformis Roxb. caused by Kawakamia cyperi (Miyabe and Ideta) Miyabe.**—*Indian J. agric. Sci.*, vi, 4, pp. 992–993, 1 pl., 1936.

Cyperus tegetiformis Roxb., used in Bihar as a fodder, has for some years past shown a diseased condition of the twigs and leaves during the rainy season, the affected culms being bright yellow, later reddish-brown, and finally wilting. Diseased material showed the presence of a non-septate mycelium, and conidia 30 to 70 by 20 to 35 μ, with a prominent, brittle beak 3 to 15 μ long, sometimes attached, and a persistent pedicel. The fungus is identified as *Kawakamia cyperi* (Miyabe and Ideta) Miyabe. It is stated that H. M. Fitzpatrick considers this genus inseparable from *Phytophthora.*

WOLLENWEBER (H. W.) & HOCHAPFEL (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. I. Phomopsis, Dendrophoma, Phoma und Ascochyta und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. I. *Phomopsis*, *Dendrophoma*, *Phoma*, and *Ascochyta*, and their relationship to fruit-rotting.]—*Z. Parasitenk.*, viii, 5, pp. 561–605, 20 figs., 1936.

In this, the first paper of a series dealing with imperfect fungi isolated by the authors during the last ten years from lesions on different host plants and timbers, descriptions are given of 20 species of *Phomopsis*, *Dendrophoma*, *Phoma*, and *Ascochyta*, with particular reference to those that were found causing rots of dessert fruits and cucurbits in the Berlin markets or were shown to be able to attack them. A dichotomous key to these species is appended.

Phoma enteroleuca [*R.A.M.*, viii, p. 754], which is renamed *Phomopsis enteroleuca* n.comb., was isolated from a rotting pear, and was shown to be pathogenic to this host. Morphologically indistinguishable strains of *P. ambigua*, the pycnidial stage of *Diaporthe ambigua* [ibid., xiii, p. 525], were isolated from rotting apples, quinces, discoloured wood of elm and yew (*Taxus baccata*), and dying twigs of walnut (*Juglans regia*), and red chestnut (*Aesculus carnea*); all the isolations were shown to cause a rot of apple, pear, and quince fruits. The fungus appears to have a life-cycle which may include one or several species of *Phoma*. *P. aceris-negundinis*, isolated from overwintered fruits of *Acer negundo* near Berlin, was able to cause a rot of apples. It differs from *P. striaeformis* in the more rounded shape and somewhat smaller size of its fructifications. *P. destructiva* [ibid., xv, p. 781] is fairly frequent on ripening tomato fruits, causing a wet rot, in the neighbourhood of

None of the strains of the fungus tested was able to attack apples, pears, cucurbits, or carrots, but all were pathogenic to tomato fruits. The new combination *P. glomerata* is suggested instead of *Coniothyrium glomeratum*, the synonymy appended consisting of eleven other binomials, including *P. alternariaceum* [ibid., xiv, p. 761] and *P. richardiae* [ibid., i, p. 150]; it is stated to be economically important only by reason of the rot it causes to tomato fruits, since tests showed that it is not pathogenic to pome fruits or plums. *Depazea prunicola* is renamed *P. prunicola* n.comb., the synonymy appended including *Phyllosticta pirina* [ibid., xi, p. 159] and *P. prunicola* [ibid., x, p. 296]. From *Phoma glomerata* the fungus differs in the somewhat smaller size of its spores and in the larger size of its fructifications, which may be furrowed on the outside. Although it has been frequently isolated from the core of entirely sound apples, it has been shown to be incapable of attacking this fruit even when wounded. *Ascochyta* [*Didymella*] *lycopersici* [ibid., xv, p. 690] was shown to attack apples, pears, and lemons, besides tomatoes, but not plums. In nature, however, it has not been recorded on hosts other than the tomato. *A. pirina* [ibid., x, p. 296], isolated from various sources, was also shown to be pathogenic to apples, pears, and lemons. *A. pisi* [ibid., xv, pp. 273, 468, *et passim*] and its variety *foliicola* n.comb. were both proved to be pathogenic to apples, and *A. pisi* also to tomato fruits.

Birmingham (W. A.). **Wood rot and limb blight of fruit trees.**—*Agric. Gaz. N.S.W.*, xlvii, 9, pp. 507–511, 5 figs., 1936.

In New South Wales yellowish wood rot due to *Polystictus versicolor* [*R.A.M.*, vi, p. 167; xvi, p. 4] occurs on re-worked apples, pears, and plums, as well as on peaches, apricots, and citrus trees. Many trees after re-working are killed by the disease, and the vitality of others is seriously impaired. In some cases infection extends along the main limbs and well down the trunk. The author recommends that in re-working trees cuts should be cleanly made and treated with an antiseptic, the surfaces being allowed to dry thoroughly before receiving a final coat of white lead or other protective covering. In the affected districts a dormant spray of Bordeaux mixture (6–4–22) should be applied. Tools used in removing the diseased material should be sterilized in 3 per cent. formalin before use elsewhere.

Heart rot (*Schizophyllum commune*) [ibid., ii, p. 271; xiv, p. 348] severely affects numbers of re-worked apple, cherry, and plum trees, many of which succumb. In one instance, all the apple trees (not re-worked) in one locality had to be grubbed out owing to the disease, and in another area 70 per cent. of the trees were badly infected. In a third district, 100 out of 500 peach and nectarine trees were severely attacked. The disease is characterized by a blackish stain which may extend a foot or two down the bark; its appearance is followed by the production of sporophores. The bark may crack longitudinally, and ultimately cankered areas form and whole limbs die. Infection occurs through injured surfaces, and control includes the proper dressing of wounds and avoiding injury to the trees.

Pink disease (*Corticium salmonicolor*) [ibid., xiv, p. 146] has been

apple trees at Glenorie in 1934, and two Allsop apple trees at Laughtondale in 1936. It did considerable damage to the limbs of the Carrington trees. The affected branches should be removed well beyond the infected part, at the junction with the next oldest limb, and burned. All wounds and cuts should be painted with white lead or tar. Where a regular spraying programme is not carried out a dormant application of Bordeaux mixture (6–4–40) or lime-sulphur (1 in 14) should be made every year.

BIRMINGHAM (W. A.). **Jonathan spot of Apple.**—*Agric. Gaz. N.S.W.*, xlvii, 9, p. 512, 1936.

A brief, popular account is given of Jonathan spot [*R.A.M.*, xv, p. 300], recorded on ten varieties of apple in Australia, and for the control of which the author recommends harvesting promptly at the correct picking stage and in any case on the first indication of the condition, and immediate, well-aerated storage at 33° to 34° F. for a period not exceeding three or four months.

SUTHERLAND (R.). **Factors relating to the control of soft-scald in Jonathan Apples.**—*N.Z. J. Agric.*, liii, 3, pp. 161–166, 1 fig., 1936.

Cold storage experiments carried out over a period of four years in New Zealand on the causes of wastage in Jonathan apples showed that soft scald [*R.A.M.*, xv, p. 811] varies in its prevalence from season to season, but often causes serious loss. Both fungal rots and internal breakdown were seldom serious when the apples were removed from cold storage, but developed in varying amounts during ripening. Susceptibility to soft scald varies with the locality and the orchard, while clear evidence was obtained that the condition is associated with fungal rotting. Jonathan apples 14 days after removal from storage at 34° F. showed (averages for three seasons) 8, 2·5, and 1·5 per cent. soft scald, internal breakdown, and fungal rots, respectively, the corresponding figures for fruit stored at 37° being 3, 2·5, and 1·5 per cent. This indicates that soft scald may be minimized by storage or transport at a relatively high temperature. Samples stored at 34°, 37°, and 32° to 42° (the last lot in a pre-cooler in which the higher temperature generally prevailed) developed 10, 2·4, and 0 per cent. soft scald, respectively. Delaying cold storage for ten days after gathering in all cases increased the amount of soft scald that developed in samples picked in two stages of maturity, the figures being 2 and 5 per cent. soft scald for the first picking (immediate and delayed storage, respectively) and 3 and 8 per cent. for the second. Oiled wrappers did not reduce soft scald incidence. Fertilizer treatments gave inconclusive results in reducing susceptibility, which was augmented by increased rainfall at the end of the growing season.

It is concluded that fruit picked when neither overripe nor insufficiently mature is least liable to the condition. Immediate cooling after gathering is advised, with cold storage at 36° to 38°. The writer considers that the term 'soft scald' is misleading, since the condition is not related to superficial scald, but is rather a form of external

KADOW (K. J.) & ANDERSON (H. W.). **Further studies on zinc sulfate in Peach sprays with limited tests in Apple sprays.**—*Bull. Ill. agric. Exp. Sta.* 424, pp. 131–144, 1936.

In this bulletin the writers sum up and discuss the results of seven years' experimental work to determine the value of zinc sulphate as an ingredient in peach and apple sprays under Illinois conditions [*R.A.M.*, xv, p. 235]. Much of the information is concerned with the value of the compound in reducing injury from lead arsenate and lime mixtures. In laboratory tests zinc sulphate proved much more toxic to apple scab (*Venturia inaequalis*) than to brown rot (*Sclerotinia fructicola*), but in the field it was only 65 per cent. effective in the control of the former disease. On the basis of these investigations, therefore, zinc sulphate cannot be recommended as a component of apple fungicides.

CRISTINZIO (M.). **Studio sulla ruggine delle Drupacee (Puccinia pruni-spinosae, Pers).** [A study on the rust of stone fruits (*Puccinia pruni-spinosae*, Pers).]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), v, pp. 15–48, 2 pl. (1 col.), 1 fig., 4 graphs, 1936.

In morphological and biological studies of *Puccinia pruni-spinosae* [*R.A.M.*, xv, p. 590; xvi, p. 47] on almond, apricot, myrobalan [*Prunus divaricata*], plum, and peach carried out at Portici, it was found that the colour, size, and distribution on the leaf surface of the uredosori and teleutosori, and the colour and size of the leaf lesions, vary with the host, as also does the shape of the paraphyses, uredospores, and teleutospores. Both the uredo- and teleuto-sori range from 100 μ in diameter on myrobalan to 1,000 μ on plum. The paraphyses show a long, thin, undulating stalk with an almost spherical apical swelling on myrobalan, a short stalk, with a depressed apical swelling on plum, a stout but rather long stalk, and a subspherical apical swelling on apricot, while on peach they are claviform, with a short, stout stalk and only a slight apical swelling. The uredospores range from 18 to 28 by 15 to 25 μ on myrobalan to 25 to 45 by 12 to 16 μ on apricot, and the teleutospores from a mean of 26 by 16 μ on myrobalan to 39 by 26 μ on apricot, with stalks varying from 13 μ long on myrobalan to 28 μ on almond. The results as a whole show that on different hosts the fungus produces special morphological entities with constant characters.

P. pruni-spinosae is mainly confined to the leaves, and in severe infections, such as occurred locally in 1934–5, premature leaf fall results, the vigour of the trees being impaired. No aecidia were found on anemone, the alternate host. Locally, the fungus overwinters by means of the uredosori on the branches, or even by means of the spores, which are very resistant to high and low temperatures. Cross-inoculations showed that no genetic variations correspond with the morphological differences on the various hosts. For control of the disease, the trees should be sprayed with a 4 per cent. copper mixture immediately after leaf fall and shortly before flowering in the spring, and again with a 1 per cent. mixture at the end of April and M

KUNKEL (L. O.). **Heat treatments for the cure of yellows and other virus diseases of Peach.**—*Phytopathology*, xxvi, 9, pp. 809–830, 3 figs., 1 graph, 1936.

This is an expanded account of the writers' experiments in the control of peach yellows, little peach, rosette [*R.A.M.*, xvi, p. 65], and red suture [ibid., xiv, p. 298], a preliminary note on which (referring to yellows and rosette) has already been cited [ibid., xiv, p. 374]. It was found possible to cure dormant trees affected by yellows by a ten minutes' dip in a tank of water held at 50° C., while the virus was inactivated (without injury to the buds) by immersion of the bud sticks at 34° to 35° in 4 to 5 days, at 38° in 11 hours, at 42° in 40 minutes, at 46° in 15, at 48° in 14, at 50° in 3 to 4, at 54° in $1\frac{1}{2}$ minutes, and at 56° in 15 seconds. Little peach and red suture proved amenable to treatments effective against yellows, but rosette was more refractory, surviving two hours' exposure to a temperature of 40° and only succumbing after 8 to 10 minutes at 50°. Once the rosette had become systemic in a tree heat treatments were unavailing, the trees dying quickly from heat injury, but cures were readily effected when the applications were made from one to three weeks after infection.

HAHN (G. G.). **Immunity of Viking Red Currant from White Pine blister rust under field conditions.**—*Phytopathology*, xxvi, 9, pp. 860–875, 2 figs., 1936.

A tabulated account is given of three years' observations (1932 to 1934) on the reaction of the Norwegian Viking red currant variety to eastern and western North American strains of *Cronartium ribicola* [*R.A.M.*, xvi, p. 74] on 28 plots in the eastern and north-western United States and Canada, natural infection being supplemented by artificial inoculations. The results fully corroborated those obtained in greenhouse trials [ibid., xiv, p. 377] in respect of the virtual immunity of Viking from blister rust. Resistance to drought was also shown by Viking. In preliminary experiments with open-pollinated seedlings of the variety propagated from Norwegian and American seed a very high percentage of immunity from blister rust was shown, indicating that this character is dominant in the parent. The possibilities of extended cultivation of Viking in blister rust-control and non-control areas are discussed.

PIERSON (R. K.). **A method of separating the teliospores of Cronartium ribicola.**—*Phytopathology*, xxvi, 9, pp. 923–925, 1 fig., 1936.

The separation of the teleutospores of *Cronartium ribicola* on *Ribes* leaves [see preceding abstract] from the matrix binding them firmly together in compact columns may be effected by immersing the material in normal nitric acid, boiling vigorously until the columns begin to become detached and bleached, adding cold water, allowing to settle, and decanting off and washing four or five times to remove the acid before mounting the columns in glycerine or glycerine jelly, the chains of spores being broken up by movement of the cover slip. The method is also applicable to *C. occidentale*.

REYPENS (J. L.). **La production de la Banane au Cameroun.** [Banana production in the Cameroons.]—*Publ. Inst. nat. Étud. agron. Congo Belge*, Sér. techn., 7, 23 pp., 19 figs., 1 map, 1936.

In this account of the banana-growing industry in the Cameroons, where the Gros Michel variety imported from Costa Rica is cultivated for export to Europe, the author states that the only diseases so far observed are isolated cases of a bacterial vascular disease and cigar-end rot [*Stachylidium theobromae*: *R.A.M.*, xv, p. 633], the latter being rather more common, but causing no serious damage.

MCCALLAN (S. E. A.), HARTZELL (A.), & WILCOXON (F.). **Hydrogen sulphide injury to plants.**—*Contr. Boyce Thompson Inst.*, viii, 3, pp. 189–197, 3 pl., 1936.

A brief study of the action of hydrogen sulphide gas on 29 species of green plants fumigated in glass chambers out of doors during the growing season showed that young tissue was more sensitive to injury than old. The young shoots and leaves developed scorching, the next older leaves basal and marginal scorching, and the mature leaves remained unaffected. The symptoms were usually fully expressed within a few days of treatment. At concentrations below 400 p.p.m. carnation, purslane (*Portulaca oleracea*), Boston fern (*Nephrolepsis exaltata* Schott var. *bostoniensis* Davenport), apple, cherry, peach, strawberry, and *Coleus blumei* Benth. showed no appreciable injury. At concentrations from 40 to 400 p.p.m. pepper (*Capsicum frutescens*), rose, nasturtium (*Tropaeolum minus*), castor bean (*Ricinus communis*), gladiolus, sunflower, buckwheat, and cornflower (*Centaurea cyanus*) showed slight to moderate injury. Soy-bean, Turkish tobacco, aster, kidney bean (*Phaseolus vulgaris*), cucumber, *Nicotiana glauca*, *Salvia splendens*, California poppy (*Eschscholzia californica*), tomato, sweet clover (*Melilotus alba*), radish, *Coreopsis* sp., and *Cosmos* sp. showed slight injury below 40 p.p.m. and severe injury and death above 400 p.p.m. Injury increased rapidly with rise in temperature. Some wilted plants appeared less susceptible to injury than normal ones. When aster, buckwheat, sunflower, and tomato plants were sprayed with lime-sulphur 1 in 20 symptoms identical with those due to hydrogen sulphide were produced.

RECKENDORFER (P.). **Über den Zerfall des Kupferkalkbrühe-Komplexes. (Ein analytischer Beitrag zur Kenntnis des 'wasserlöslichen' Kupfers.)** [On the decomposition of the Bordeaux mixture complex. (An analytical contribution to the knowledge of 'water-soluble' copper.)]—*Z. PflKrankh.*, xlvi, 9, pp. 418–438, 1936.

After briefly surveying the various theories that have been advanced to explain the fungicidal effect of Bordeaux mixture the author states that the results of the laboratory experiments described in some detail in this paper would appear to support the view of Millardet, who ascribed the toxicity of the mixture to soluble copper compounds produced by the action of atmospheric carbon dioxide on the spray deposit under the influence of moisture. The experiments were made with powdered air-dry sediment obtained from 1–1–100 Bordeaux mixture, prepared according to the method of Wöber (*Z. PflKrankh.*,

xxix, [pp. 94–104], 1919), 1 litre of the mixture yielding 10 gm. spray deposit.

It was shown that both carbon dioxide and atmospheric moisture are indispensable for the liberation from the deposit of water-soluble copper compounds. The author considers that the deposit under the influence of carbon dioxide and atmospheric moisture undergoes a series of changes representing eight phases [which are tabulated], the final products being $CuSO_4$, $Cu(HCO_3)_2$, and $Ca(HCO_3)_2$. During dry periods the soluble copper compounds, by losing some of the carbonic acid, revert back to an insoluble state until the next precipitation, when the soluble compounds are again formed, and so on. These alternations are an important factor in the prophylactic efficacy of Bordeaux sprays, as the 'spurts' in the toxicity of the deposits coincide in time with the germination of the fungal parasite, and furthermore they protect the host against the scorching effect of the soluble toxic compounds, which is most troublesome during prolonged wet spells. Further tests showed that the toxic compounds are $CuSO_4$ and $Cu(HCO_3)_2$, and that they are of a crystalloid nature, since in solution they freely passed colloidal filters. In experiments on the effect of thickness of the deposit on toxicity, 10 gm. of the air-dry sediment was used to cover glass surfaces of from 500 to 5,000 sq. cm., and the treated surfaces were subjected to daily wetting and exposure to ordinary laboratory atmosphere at a temperature of 20° C. It was found that the thinnest films released daily 0·151 per cent. of soluble copper, while the thickest only released 0·006 per cent. at the end of the first 24 hours, 0·014 per cent. during the next period of 24 hours, and 0·025 per cent. during the fourth and consecutive periods tested. It was computed that the thinnest film could remain active under laboratory conditions for 150 consecutive days, but under the conditions that are usual in the open, it is not expected that a spray deposit could retain enough copper to be effective longer than six weeks. It is computed that at temperatures of about 20° C., the deposit left by 1–1–100 Bordeaux mixture on vine leaves liberates 0·000,001 gm. of water-soluble and active copper per sq. cm. of leaf surface in 24 hours. The work finally indicated that to be fully effective Bordeaux mixture should be applied in time to afford protection against invasion of the host by the parasite.

Schnegg (H.) & Weigand (K.). **Borsäure-Studien.** [Boric acid studies.] —*Zbl. Bakt.*, Abt. 2, xcv, 5–8, pp. 154–167, 1936.

An examination of 17 samples of 3 per cent. boric acid solutions obtained from chemists and druggists in different parts of Germany revealed contamination by micro-organisms (444 to 56,800 per c.c.) in all [cf. *R.A.M.*, xiv, p. 114], chiefly represented by pale and deep red *Torula* spp., *Dematium* [*Pullularia*] *pullulans*, and 'black yeasts', while a white *Torula*, *Penicillium glaucum*, *Oidium* [*Oospora*] *lactis*, and *Mucor racemosus* were also detected. The organisms remained viable for lengthy periods in the solutions, a red *Torula*, for instance, being detected after three years. Boric acid solutions prepared in the laboratory remained sterile after months of storage, and the contamination of the commercial solutions may be attributed to the presence of the

organisms concerned in the storage vessels even after cleansing. Other organisms tested could not withstand immersion in 1 to 4 per cent. boric acid solutions for longer than a fortnight at the most. The results of these experiments do not encourage the use of commercial boric acid for medicinal and food-preservative purposes.

AHLBERG (O.) & INGELSTRÖM (E.). **Sjukdomar och skadedjur som angripa våra viktigaste lantbruks- och trädgårdsväxter.** [Diseases and pests that attack our principal agricultural and horticultural plants.]—*Medd. Växtskyddsanst., Stockh.*, 17, 74 pp., 8 pl., 1936.

This useful compilation, arranged in alphabetical order of the hosts, contains much valuable information, clearly and concisely presented, on the symptoms, etiology, and control of some prevalent or economically important pests and diseases of agricultural and horticultural plants in Sweden.

GALLOWAY (L. D.). **The storage of fungal cultures.**—*Indian J. agric. Sci.*, vi, 4, pp. 947–955, 1 fig., 1936.

Experimental tests on the storage of fungi, mainly saprophytic moulds, on sand in sealed tubes for one or two years based on Thaysen's method (*J. Inst. Brewing*, xl, p. 469, 1934) showed that many fungi possessing resistant spores or sclerotia retained their vitality for 1½ to 2 years when stored by this method. Such cultures should not be relied upon exclusively, however, for maintaining species in viable condition.

HOPP (H.). **Control of atmospheric humidity in culture studies.**—*Bot. Gaz.*, xcviii, 1, pp. 25–44, 8 figs., 1 diag., 2 graphs, 1936.

The author summarizes methods in vogue for the control of relative humidity and discusses in detail several new procedures with reference to their value in cultural studies. Chemical control is the most convenient for small closed chambers; intermittent vaporization controlled by a hygrostat and humidifier is best for large chambers.

RAMSBOTTOM (J.). **The uses of fungi.**—*Rep. Brit. Ass., 1936*, pp. 189–218, 1936.

A comprehensive and interesting account is given of the various economic and industrial uses to which fungi are put.

MCROSTIE (G. P.). **Advisory committee on plant diseases.**—*Rep. Canad. Seed Grs' Ass., 1935–1936*, pp. 31–33, 1936.

At the annual meeting of the Canadian Seed Growers' Association in 1932, an advisory committee on plant diseases was established, the report of which, listing various diseases known to attack some of the registrable crops in the country, and suggesting tentative percentages of tolerance, was presented in 1934. The adoption of this report, with certain modifications, is now (1936) recommended. In the case of ergot (*Claviceps purpurea*) in barley [*R.A.M.*, ix, p. 287], it is suggested that the percentage of tolerance be changed from 0·1 per cent. in the field or 1 per bush. to 0·5 per cent. or 10, respectively. As regards club root of swedes [*Plasmodiophora brassicae*: ibid., xv, p. 416], it is recommended that the tolerance be entirely omitted instead of the 10 per

cent. in resistant varieties originally scheduled in the report. Other proposed limits of tolerance include 5 per cent. mosaic in lucerne and sweet clover [*Melilotus alba*: ibid., xv, p. 274], 5 per cent. Stewart's disease (*Bacterium* [*Aplanobacter*] *stewarti*) in maize [ibid., xv, p. 573], 1 per cent. mosaic in beans [*Phaseolus vulgaris*: ibid., xv, p. 766; xvi, p. 22], and 0·5 per cent. *Ascochyta pisi* in peas, *Phoma betae* in beets, black rot of cabbage and cauliflower (*Pseudomonas campestris*), black leg of cauliflower (*Phoma lingam*) [ibid., xiv, p. 547], and bacterial canker (*Bact.* [*A.*] *michiganense*) [ibid., xv, p. 559] and leaf spot (*Septoria lycopersici*) of tomato.

RIKER (A. J.) & RIKER (REGINA S.). **Introduction to research on plant diseases. A guide to the principles and practice for studying various plant-disease problems.**—117 pp., 14 diags., 2 graphs, published by the authors, University of Wisconsin, 1936. Price $2·65. [Mimeographed.]

This manual is designed primarily as a reference text of selected technique for research workers and advanced students. The eleven chapters deal with 'the foundation of a research problem; general laboratory equipment; culture media; certain physico-chemical measurements; isolation, culture, and inoculation; virus diseases; certain procedures for pathological history; epidemiology, environment, and control; statistical analyses; records and manuscripts; and laboratory exercise topics;' each is succeeded by a bibliography of the relevant literature. The work is eminently of service to students entering upon research, besides providing a useful reference book for experienced scientists.

RENN (C. E.). **Persistence of the Eel-Grass disease and parasite on the American Atlantic Coast.**—*Nature, Lond.*, cxxxviii, 3490, pp. 507–508, 1936.

Particulars are given of the writer's survey, during the early summer of 1936, of the position along the American Atlantic coast as regards the *Zostera* wasting disease [*R.A.M.*, xv, p. 820]. Symptoms of the decline were everywhere present and some beds, e.g., in Great Bay, Long Island, have entirely disappeared. The *Labyrinthula* previously described was universally present in an active state in the streaked or mottled leaves. Judging by past experience, the parasite may be expected to overwinter in the leaves in a quiescent state and to resume its virulent attacks during the early summer, when the vitality of the host is at a low ebb.

LYNN (MARY J.). **The scarcity of Zostera marina (Slitch, Eel-Grass, or Grass-Wrack) in Strangford Lough.**—*Irish Nat. J.*, vi, 5, pp. 107–117, 1 fig., 1 map, 1936.

A detailed account is given of the serious incidence of wasting disease of *Zostera marina* in Strangford Lough, Co. Down, Northern Ireland, where neither *Ophiobolus halimus* nor *Labyrinthula* [see preceding abstract] has so far been detected. The narrow-leaved *Z. marina* var. *angustifolia* has been even more severely affected than the broad-leaved

form, contrary to observations elsewhere, but *Z. nana*, in the few areas where it occurs, appears to be healthy.

COOK (M. T.). **Records of virus diseases of plants in Puerto Rico.**—*J. Agric. P.R.*, xx, 3, pp. 681–684, 1936.

Of the virus diseases recorded in this paper the following may be mentioned. Pineapple yellow spot and wilt [*R.A.M.*, xv, p. 378] were introduced from Hawaii into Porto Rico in 1923 and 1931, respectively, on two shipments of Smooth Cayenne slips, which, while under observation for two years, appeared perfectly healthy; but the diseases were again found in both plantings in 1934. Similar but not precisely the same symptoms have been observed on Cabezona pineapples near Lajas. Spike disease, not observed in Porto Rico for thirteen years, was found recently in the Cabezonas. The first very severe outbreak of cucumber mosaic noted by the author during the same period occurred during the winter of 1935–6. Maize was affected by a white stripe disease [see above, p. 93] apparently identical with that reported from Cuba in 1927 [ibid., vii, p. 159] and Trinidad in 1933 [ibid., xii, p. 756]. Mosaic diseases were also recorded on *Crotalaria anagyroides*, *C. usaramoensis*, *Phaseolus lunatus*, and very rarely on bananas. 'Enano' plantains were affected by a condition, apparently of virus origin, characterized by failure of the spirals to unroll properly. Parts of the outer leaf may become dead, brown, and torn by the growth of the inner parts. When the leaves of the spiral unroll they are chlorotic and crinkled; in severe cases they turn brown and die.

COOK (M. T.). **First supplement to the host index of virus diseases of plants.**—*J. Agric. P.R.*, xx, 3, pp. 691–727, 1936.

This supplement to the author's host index of plant virus diseases [*R.A.M.*, xv, p. 107] adds 10 families, over 50 genera, and about 105 species to the original work.

OTÉRO (J. I.) & COOK (M. T.). **Second supplement to partial bibliography of virus diseases of plants.**—*J. Agric. P.R.*, xx, 3, pp.741–819, 1936.

This second supplement to the authors' partial bibliography of the literature of plant virus diseases [*R.A.M.*, xv, p. 40] deals with papers mostly published in 1934 to 1936. [The pagination given in the indexes appended appears to be consistently 4 pp. in excess of the correct numbers.]

DOERR (R.). **Allgemeine Merkmale der Virusarten.** [General characteristics of viruses.]—*Z. Hyg. InfektKr.*, cxviii, 6, pp. 738–747, 1936.

This is the report of a lecture, delivered at the second International Congress of Microbiology, held in London in July, 1936, on some of the outstanding general features of the ultra-microscopic viruses, including bacteriophage [*R.A.M.*, xv, p. 595], presented and critically discussed in the light of current researches. The author does not concur in the view that the viruses represent a natural entity or biologically uniform

group of infective principles, the evidence in favour of this hypothesis at the present stage being, in his opinion, totally unconvincing.

KOSTOFF (D.). **Virus and genic reactions in morphogenetic, physiogenetic, and phytogenetic aspects.**—*Phytopath. Z.*, ix, 4, pp. 387–403, 12 figs., 1936.

An attempt is made to present a comparative study and discussion on the nature and activity of viruses and genes on the basis of original observations and those of other workers in the same field. A number of analogies are drawn between these two ultra-microscopic entities, which appear, for instance, to belong to the same physico-chemical category of particles and to produce similar effects (systemic or local) in plants. Certain phenomena, such as variegation, may proceed either from viruses or from genes, while both groups share antigenic properties. Although it would be premature to claim that any proof is yet forthcoming of identity between viruses and genes, a clue to further studies along these lines is thought to have been afforded by the present, admittedly preliminary, investigations.

TROTTER (A.). **Ulteriori osservazioni sulle 'virosi' del Cestrum parqui L'Hér.** [Further observations on virus diseases of *Cestrum parqui* L'Hér.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), v, pp. 61–64, 2 pl., 1936.

During the spring of 1936, *Cestrum parqui* plants which in the previous year had shown mosaic symptoms [*R.A.M.*, xiv, p. 781] developed signs of ring spot [ibid., xv, p. 752] not previously recorded from Italy, though observed earlier by the author on tobacco and *Solanum nigrum.* The symptoms appeared very early in the year, as small, simple rings or zig-zag lines, and were followed later on the same plants by mosaic and leaf roll. Locally *C. parqui* is increasingly affected by viruses and seems likely to become a permanent focus of infection for the Solanaceous crops grown in the vicinity. At the end of 1935 diseased plants of *C. parqui* showed severe aphid infestation, and it was also observed that those with the most conspicuous virus symptoms were growing near large areas sown to potato, tomato, and tobacco.

BURGEFF (H.). **Samenkeimung der Orchideen.** [Seed germination of Orchids.]—viii+312 pp., 179 figs., 4 diags., 3 graphs, Jena, G. Fischer, 1936. Price Rm.18.

Following an explanatory foreword on the nature and functions of the fungal symbionts of orchids [*R.A.M.*, xi, p. 317], the writer deals with the following aspects of orchid cultivation in relation to mycorrhiza [ibid., xvi, p. 49]: cytological structure and function of orchid mycorrhiza; seed biology of orchids; seed germination in orchids; analysis of mycorrhiza (procurement and cultivation of symbiotic fungi, a concise survey of the orchid fungi hitherto isolated, fungus-free germination); the life of the symbiotic components; the main nutritional-physiological problem of seed germination in orchids; the principal physiological factors affecting orchid development; and an appendix on practical methods of orchid cultivation from seed.

A five-page bibliography is appended.

KÖHLER (E.). **Der Virusnachweis an Kartoffeln. Eine Anleitung für Züchter und Kartoffelbegutachter.** [The detection of virus in Potatoes. A manual for breeders and Potato surveyors.]—*Mitt. biol. Anst.* (*Reichsanst.*) *Berl.*, 53, 9 pp., 19 pl., 1936.

For the benefit of potato-breeders and surveyors concerned with the diagnosis of virus diseases in Germany the writer briefly describes the symptoms of leaf roll, the X group (ring mosaic), Y virus (streak) [*R.A.M.*, xv, p. 391], A virus [see next abstracts], leaf-rolling mosaic [ibid., xv, p. 739], various innocuous forms of mosaic restricted to greenhouse plants and not transmissible to tobacco, and different virus combinations. Directions are given for the application of three methods of diagnosis, viz., tuber-indexing [ibid., xv, p. 43], transmission to Samsun tobacco, and transmission by aphids; transmission by grafts is a lengthy and complicated process which should be reserved for scientific studies. A key for the differentiation of the viruses is given.

MURPHY (P. A.) & LOUGHNANE (J. B.). **A comparison of some Dutch and Irish Potato mosaic viruses.**—*Sci. Proc. R. Dublin Soc.*, xxi, N.S., 35–41, pp. 419–430, 1 pl., 1936.

An examination of some potato mosaic diseases sent from Holland for comparison with similar diseases found in Ireland [cf. *R.A.M.*, xiv, p. 523; xv, p. 738] showed the Dutch potato mosaics to correspond almost exactly with the Irish. Thus, super-mild mosaic (Bravo variety) showed the presence of virus A [ibid., xiii, p. 257; xv, p. 460]; easily inoculable mosaic (Alpha) that of X [ibid., xvi, p. 52], B, and a form of A; rugose mosaic (Institut de Beauvais) the veinbanding virus; latent virus (Zeeland Blue) X and a form of Y or A, and possibly an unidentified virus; latent virus (Monocraat) F [see next abstract]; latent virus (Magdeburger Blaue) X and B; interveinal mosaic (Bravo) X and F; and crinkle mosaic (Bravo) X and A. Another combination, A and F, was also found possible, resulting in a yellow mosaic of the lower leaves, resembling aucuba mosaic, but apparently distinct. This list probably represents the more important potato mosaics of north-western Europe and its comparative shortness indicates that experimental research has thrown excessive emphasis on the different effects of a virus on different varieties.

The discovery in the present work of two viruses intermediate between Y and A raises very important questions as to the independence of the new forms. Thus, the aphid-transmitted virus from Alpha potatoes most resembles A, but is not identical with it, with the result that it is at present uncertain whether to regard it as a form of A or not. The corresponding virus from Zeeland Blue potatoes is more like Y, but possesses some properties of A, so that it may be a form of Y or A, or independent. At present, the evidence does not support the identity of Y and A, though it is believed that they belong to one and the same broad group.

The A, B, F, X, Y, and veinbanding viruses appear to underlie most potato mosaics of favourable maritime climates, but in continental areas, other viruses in addition are commonly implicated in potato degeneration. The virtual absence in north-western Europe of many serious American affections must be due to a failure to maintain the

requisite balance between virus and potato, as a result of which they have died out.

Clinch (Phyllis E. M.), Loughnane (J. B.), & Murphy (P. A.). **A study of the aucuba or yellow mosaics of the Potato.**—*Sci. Proc. R. Dublin Soc.*, xxi, N.S., 35–41, pp. 431–448, 3 pl., 1936.

In this paper an account is given of a comparative study of the symptoms and properties of aucuba mosaic of potato (different from tomato aucuba mosaic) [*R.A.M.*, xiv, p. 385; xv, p. 831], potato 'tuber blotch' virus [ibid., xiv, p. 605], and a latent virus from the Dutch potato Monocraat. All three were readily transmissible by sap to potato and other Solanaceous plants. The aucuba virus [the foliage and tuber symptoms of which on 14 potato varieties are tabulated] caused a yellow mottle on the lower or middle leaves of all the varieties tested, with cortex and pith necrosis on seven of them. The other two caused a similar but inconspicuous mottle of the lower leaves, sometimes preceded by the primary symptoms of rusty wilt, or no symptoms at all, in the 25 varieties tested, with a similar tuber necrosis in 13 of them. All three viruses produced identical diagnostic symptoms on *Solanum nodiflorum* and *Capsicum annuum*, consisting of brown- or purple-bordered spots, followed by rusty purple discoloration and mosaic. Inoculated into tobacco, *Datura stramonium*, and *Petunia* the three viruses produced no symptoms, aucuba mosaic, however, being differentiated from the other two by producing symptoms on tomato and *S. dulcamara*. The physical properties, including filterability (passing L1 but not L3 filters), thermal death point (all falling between 62·5° and 65° C.), and longevity *in vitro* (between 2 to 6 days) were similar in the three viruses. The tuber blotch virus was transmitted by *Myzus persicae*, but only in the presence of virus A [see preceding abstracts]. This virus and the Monocraat virus are identical, and probably correspond to the virus of pseudo-net necrosis, the aucuba virus being a distinct but related form, and the calico virus [ibid., xv, p. 459] probably related as well. The tuber blotch virus is designated F with the Monocraat virus as a synonym, and the aucuba mosaic virus G.

Potato mosaics fall into three broad groups: (1) viruses of the X type (including mottle, ring spot, healthy potato virus and the like), causing distinctive mosaic symptoms in tobacco, *D. stramonium*, *Petunia*, and other Solanaceous hosts, producing acronecrosis on Arran Crest potatoes, forming crinkle in combination with virus A, non-transmissible by *M. persicae*, and passing an L3 Pasteur-Chamberland filter candle; (2) viruses of the F type (including pseudo-net necrosis, virus G, and possibly calico virus) producing brown or purple-fringed spots on *S. nodiflorum* and *C. annuum*, followed by clear mosaic on the latter, carried without symptoms by tobacco and *D. stramonium*, producing bright yellow spotting on the lower leaves of potatoes intensified by the presence of virus A, causing hereditary parenchyma necrosis in the tubers of many varieties, transmitted by *M. persicae* in certain cases and conditions, and not passing an L3 filter candle; (3) viruses of the Y group (including virus A and veinbanding virus), readily transmissible by *M. persicae*, producing green veinbanding in tobacco, non-inoculable to *D. stramonium*, non-filterable through L3 candles, and typically

causing acropetal necrosis in certain varieties, though this varies in the case of virus A.

Garbowski (L.). **Ocena zdrowotności kłębów Ziemniaczanych drogą wstępnej hodowli kiełków.** [Determination of the health of Potato seed tubers by preliminary culture from the eyes.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 31–41, 1936. [French summary.]

Experimental evidence is presented demonstrating the practical value of tuber-indexing seed potatoes as a means of testing their freedom from virus diseases (mosaic and crinkle) [cf. above, p. 116].

Muller (H. R. A.). **Kalkgebrek en mergnecrose (roestvlekkenziekte) bij Aardappelen.** [Calcium deficiency and medullary necrosis (rusty spot disease) of Potato tubers.]—*Landbouw*, xi, 9, pp. 345–369, 1936. [English summary.]

Medullary necrosis of potato tubers [*R.A.M.*, xv, p. 253] is a very serious disease in many parts of Java and Sumatra where the limiting factor in production is calcium deficiency. From unpublished data obtained by H. C. Bongers from 1919 to 1921 it is stated that in field experiments lime dressings applied at the rate of 125 q. per hect. reduced the percentage of affected tubers from 96·8 to 26 and the symptoms, when present, were so slight that the commercial value of the crop was unimpaired. Even better results were obtained in another experiment when the application of lime at the rate of 35 q. per hect. reduced the number of diseased tubers from 94·8 to 10·4 per cent. Stable and green manures and sulphate of ammonia tended to increase the losses from the disease and superphosphate to reduce them. The disease is considered to be the same as internal brown fleck described from South Africa [ibid., xiii, p. 394]. Evidence was obtained that lime deficiency also exerted an adverse effect on maize.

Potato diseases of Victoria.—*J. Agric., Vict.*, xxxiv, 9, pp. 464–481, 24 figs., 1936.

Brief, popular notes are given on the symptoms and control of potato diseases in Victoria, including *Rhizoctonia* [*Corticium solani*], common scab (*Actinomyces* spp.) [*A. scabies*], late blight (*Phytophthora infestans*), early blight (*Alternaria solani*), powdery scab (*Spongospora subterranea*) [ibid., xvi, p. 59], black leg (*Bacillus phytophthorus* group), bacterial wilt (*Bacterium solanacearum*) [ibid., xv, p. 459], silver scurf (*Spondylocladium atrovirens*) [see below, p. 144], stringy rot (*Armillaria mellea*) [ibid., xiii, pp. 257, 552], brown fleck [?internal rust spot: ibid., xvi, p. 56], glassy end [ibid., xv, p. 821], sun scald, black heart [ibid., xi, pp. 126, 357], dry rot (*Fusarium* sp.), and spindle sprout [ibid., xv, p. 247].

Swartele (A. A.) **Bestaat er en verband tusschen het voorkomen van black heart en het optreden van virusziekten bij den Aardappel?** [Is there a connexion between the occurrence of black heart and the development of virus diseases in the Potato?]—*Tijdschr. PlZiekt.*, xlii, 9, pp. 241–252, 1 pl., 1936. [English summary.]

According to Biourge and Sokal (*Ann. Soc. sci. Brux.*, B, xlix, p. 68,

1929; *Agricultura, Louvain*, 1930, 1932; *C. R. Soc. Biol., Paris*, ciii, p. 955, 1930), black heart of potatoes [see preceding abstract] is due, not to lack of oxygen, followed by asphyxiation of the centre of the tuber, but to infection by *Bacillus mesentericus vulgatus* and *B. mesentericus ruber*. These workers further maintained that tubers affected by black heart give rise to plants showing the symptoms commonly attributed to viruses.

In the writer's experiments, however, no connexion could be traced between the occurrence of black heart in the tubers and that of viruses in the plants, while the inoculation of healthy tubers with the reputed bacterial agents of the disease gave entirely negative results. Climatic factors and soil constitution are thought to be probably the decisive, though not the only, factors in the development of black heart, which is particularly prevalent on poor ground and in tubers lifted later than usual. No correlation could be detected between the melanin content of the tubers and the incidence of black heart.

Leszczenko (P.). **Dezynfekcja gleby zakazonej rakiem Ziemniaczanym Synchytrium endobioticum (Schilb.) Perc. Komunikat tymczasowy.** [Disinfection of soil infected with Potato wart disease, *Synchytrium endobioticum* (Schilb.) Perc. Preliminary communication.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 61–71, 1936. [English summary.]

The results of experiments in 1934 and 1935 at Rzadkowo, Poland, showed that the Wohltmann potato, highly susceptible to wart disease (*Synchytrium endobioticum*), remained entirely unaffected in heavily contaminated soil treated with 12·5 or 25 l. of a 0·4 or 0·8 per cent. formaldehyde solution per sq. m., while adjacent control plots showed from 90 to 100 per cent. infection [*R.A.M.*, xv, p. 393]. Concentrations of 0·1 and 0·2 per cent. formaldehyde at 25 l. per sq. m. were ineffective.

Garbowski (L.) & Leszczenko (P.). **Badanie odporności Ziemniaków na raka Ziemniaczanego Synchytrium endobioticum (Schilb.) Perc.** [Potato tests for resistance to Potato wart disease, *Synchytrium endobioticum* (Schilb.) Perc.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 43–60, 1936. [French summary.]

The results of tests in 1934 and 1935 in Poland of 67 potato varieties for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xiv, p. 526] showed that among others the Scottish variety Incomer and the German Modrow's Preussen original were definitely susceptible. The new Polish varieties Ajaks, Atena, Barbara, Cella, Hajduk, Herkules, Hymen, Ikar, Ilion, Iris, Kastor, Kazimierz, Mentor, Neotopaz, Orkan, and No. 201 Plomyk remained immune, both in the laboratory and field tests.

The second section of this paper gives a review of recent work on the genetics of resistance in the potato to wart disease, together with some observations by the authors indicating that conclusions should

be based on the results of laboratory infections rather than on those of field trials.

NĚMEC (A.). **Biochemické studie k otázce rakoviny Bramborů. I. Složeni minerálnich látek v hlízách resistentnich a neresistentnich odrůd Bramborů.** [Biochemical studies on the problem of Potato wart disease. I. Composition of the mineral substances in resistant and susceptible Potato varieties.]—*Ann. Acad. tchécosl. Agric.*, xi, 3, pp. 310–316, 1936. [German summary.]

In continuation of his studies of the conditions conducive to outbreaks of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xiv, p. 650], the author investigated the mineral composition of the ash obtained from the tubers of 16 immune and 16 susceptible potato varieties. The results showed no significant difference in the phosphoric acid, lime, silicic acid, or sulphuric acid contents of the tubers of the two groups. On the other hand, the immune varieties were shown to have a markedly higher content in magnesium (average 0·248 per cent. MgO) than the susceptible (0·165 per cent.) and a moderately higher content in potassium and manganese. Particular significance may be attached to the lime : magnesium oxide ratio, which on the average was 3·18 in the immune and 2·02 in the susceptible varieties, as well as to the potassium oxide : magnesium oxide ratio (average 9·99 in the immune and 14·21 in the susceptible).

NĚMEC (A.). **Über die Zusammensetzung der Mineralstoffe in krebsbefallenen Kartoffelknollen.** [On the composition of the mineral substances in wart-infected Potato tubers.]—*Phytopath. Z.*, ix, 4, pp. 417–425, 1936.

A tabulated account is given of the author's investigations on the mineral composition of the ash of healthy and wart- [*Synchytrium endobioticum*: see preceding abstract] diseased potato tubers of various varieties from different places in Bohemia. Apart from differences attributable to the differences in the soil and other environmental conditions under which the potatoes had been grown, the results consistently showed that the diseased tubers yielded less total ash and contained less magnesium than the apparently healthy tubers of the same variety, while lime was somewhat more abundant in the former, the average figures obtained being ash 3·8, magnesium oxide 0·240, and lime 0·120 per cent. of the dry substance in the healthy tubers, as against 2·247, 0·075, and 0·136 per cent., respectively, in the diseased tubers. On incineration the wart proliferations gave on the average ash 2·553, magnesium oxide 0·046, and lime 0·211 per cent., showing that they contained less magnesium and more lime than whole diseased tubers. The magnesium oxide : lime ratio varied from 1·85 to 2·68 in the various healthy, and from 1·09 to 1·55 in the diseased, tubers tested, being consistently lower in the latter. It is suggested that the reduction in magnesium which was found in the wart diseased tubers may be due, at least in part, to the fact established by Weiss and Harvey [*R.A.M.*, i, p. 131] that *S. endobioticum* has an acidifying effect on the juice of the potato tubers attacked by it.

WIERINGA (K. T.) & WIEBOLS (G. L. W.). **De Aardappelschurft en de heterolyse der schurftparasiet.** [Potato scab and the heterolysis of the scab parasite.]—*Tijdschr. PlZiekt.*, xlii, 9, pp. 235–240, 1 pl., 1936.

The development of Actinomycetes in the soil is limited by two forms of antagonism, active and passive, the former comprising the action of (*a*) heterolytic agents, and (*b*) filterable and transmissible bacteriophages, and the latter competition with other micro-organisms and the production of growth-inhibiting substances. Details are given of experiments in which the bacteriophages derived from cultures of *Actinomyces roseus*, *A. bovis*, and *A. farcinicus* [*R.A.M.*, vii, p. 241] were applied to the causal organism of potato scab, *A. scabies*, with very successful results both on solid and liquid bouillon media in the case of the bacteriophage of *A. bovis*, which also induced lysis of *A. farcinicus* cultures. Further studies are planned to determine the practical possibilities of this method of combating the disease.

LUTMAN (B. F.), LIVINGSTON (R. J.), & SCHMIDT (A. M.). **Soil Actinomyces and Potato scab.**—*Bull. Vt agric. Exp. Sta.* 401, 32 pp., 4 pl., 20 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 5, pp. 644–645, 1936.]

A fairly full review is presented of the published work on potato scab (*Actinomyces*) [spp. including *A. scabies* : *R.A.M.*, xvi, p. 58 and preceding abstract], accompanied by discussions of the methods of soil counts and plating out of the micro-organisms [ibid., ix, p. 58; xiv, p. 392], the species of *Actinomyces* being differentiated into two groups, one colourless and the other producing a brown pigment on culture media [ibid., xiii, p. 50].

During the period from 1914 to 1917 susceptible varieties were grown on two field plots (sandy and heavy clay loam, respectively) to determine their reaction to the disease, with the result that nearly 100 per cent. of badly scabbed tubers developed on the former soil and almost as many on the latter in 1916. Potatoes were excluded from the rotation in the sandy loam plot between 1916 and 1934, but were twice planted on the heavy clay during the same period. From 1924 to 1931 inclusive bacterial counts were made monthly by the plating out method (1 in 1,000,000 dilution), the total numbers of micro-organisms and actinomycetes being determined on a 1 gm. of dry soil basis.

The peak was reached during the winter (November to April), coinciding with the maximum degree of soil moisture. The *Actinomyces* counts were roughly parallel with those of the total incidence of micro-organisms, and during the eight-year period the numbers of the former remained relatively stable. The *Actinomyces* occurred mainly in the form of mycelial fragments with comparatively few spores.

Disinfected Green Mountain potato seed planted on the sandy loam soil in 1935, after a 19-year absence, yielded 70·2 per cent. clean tubers, 26·5 per cent. slightly scabbed, and 3·3 per cent. badly scabbed, the corresponding figures for the 1916 crop being 0·0, 0·8, and 99·2 per cent., respectively. The senior author is inclined to believe that the pathogenic species of *Actinomyces* do not actually die out of the soil

in the absence of potatoes but merely undergo a diminution of pathogenicity in the presence of uncongenial crops and regain their virulence on the return of the preferred host.

ALLINGTON (W. B.). **Sclerotial formation in Rhizoctonia solani as affected by nutritional and other factors.**—*Phytopathology*, xxvi, 9, pp. 831–844, 1 fig., 1936.

The effect of nutritional factors, temperature, and hydrogen-ion concentration of the substratum on sclerotial production by *Rhizoctonia* [*Corticium*] *solani* from potato [*R.A.M.*, xv, p. 46] in Nebraska was studied in pure culture on potato dextrose agar and a modified Czapek's medium.

No sclerotia were formed until all the agar in the dish was covered by the colony. The process was favoured by a relatively low carbohydrate and high nitrogen content of the medium, the most powerful stimulus being given by calcium nitrate, followed in decreasing order by asparagin, ammonium nitrate, urea, and sodium nitrate. Glucose, sucrose, and potato starch were equally efficacious as sources of carbon, but glycerol and lactic acid were not readily utilized by the fungus. *C. solani* made the most luxuriant growth at P_H 7, sclerotia being formed in profusion; at 4, 5, and 6 the number of these organs was reduced and at 8 they failed to develop. The maximum growth of the fungus was made at 25° C. [ibid., viii, p. 138; xiv, p. 208]; at 5° it was unable to develop but remained viable. Sclerotia were formed in 20 days on healthy seed potatoes buried in inoculated soil, so that sound seed-pieces may contract infection after planting.

MUNDKUR (B. B.). **A Rhizoctonia on Sweet Potatoes in Bombay.**—*Indian J. agric. Sci.*, vi, 4, pp. 994–995, 1 pl., 1936.

Sweet potatoes in the vicinity of Kawar, Bombay Presidency, are rather commonly affected by a strain of *Rhizoctonia solani* (*Corticium vagum*) [*C. solani*] causing shrivelling and dwarfing of the roots with the production of two to four sclerotia on the skin. This is the first record of the fungus on sweet potato in India.

RAMIAH (K.) & RAMASWAMI (K.). **Breeding for resistance to Piricularia oryzae in Rice (O. sativa).**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 450–458, 1936.

In breeding work at Madras against rice blast (*Piricularia oryzae*) [*R.A.M.*, ix, p. 87; xii, p. 266; xv, p. 779] two highly resistant strains GEB. 24 and Co. 4 were crossed with the susceptible variety Korangusamba from Tanjore on which the disease first occurred locally, and which in artificial infection studies showed up to 80 per cent. infection. Inheritance of resistance appeared to be simple in GEB. 24×Korangusamba, and more complicated in the other cross. In the former, disease-free selections from F_3 onwards bred pure for freedom from disease and after two years' trials in two localities two showed 10 to 50 per cent. increase in yield over the susceptible variety. In a postscript it is stated the same two strains gave 14 to 80 per cent. increased yield in 1935–6.

Luthra (J. C.) & Sattar (A.). **Some studies on the sclerotial disease of Rice (Sclerotium oryzae Catt.) in the Punjab.**—*Indian J. agric. Sci.*, vi, 4, pp. 973–984, 1 col. pl., 1936.

In the Punjab, the rice disease caused by *Sclerotium oryzae* [*Leptosphaeria salvinii*: see above, p. 97] occurs chiefly as a stem rot, though occasionally as a withering of the leaf blades and sheaths. In many cases, the only symptom is a discoloration of the stem bases, generally following by wilting. On frequent occasions sclerotia have been found on the stubble, though the standing crop appeared healthy.

In pot tests, infection was secured by planting rice seed or healthy seedlings in soil inoculated with diseased stubble or a pure culture of the fungus. Seedlings raised in infected soil and transplanted to inoculated and clean soil developed infection. Stem inoculations of seedlings also gave positive results, and the fungus was reisolated from the diseased plants, which showed characteristic symptoms. When seed of 19 rice varieties was sown in inoculated and uninoculated field plots infection developed in the former only, a similar result being obtained with seedlings transplanted from clean to inoculated soil, and (though to a less extent) with others transplanted from inoculated to clean soil. Marked differences in varietal susceptibility were noted, Nos. 370, 3/30, 7, 202, and 62 being amongst the more resistant strains. Experimental evidence demonstrated that infection results when rice is grown in soil that has borne a diseased crop the previous year.

Katsura (S.). **The stunt disease of Japanese Rice, the first plant virosis shown to be transmitted by an insect vector.**—*Phytopathology*, xxvi, 9, pp. 887–895, 1936.

This is a review, accompanied by explanatory comments, of the literature on 'stunt' (commonly known as 'dwarf') disease of rice, carried by the leafhopper, *Nephotettix apicalis* var. *cincticeps* [*R.A.M.*, xv, p. 48], the earliest record of which in the Shiga prefecture of Japan dates from 1883; it is stated to be the first authenticated case of the transmission of a virus by an insect vector.

Kalinenko (V. O.). **The inoculation of phytopathogenic microbes into rubber-bearing plants by nematodes.**—*Phytopath. Z.*, ix, 4, pp. 407–416, 7 figs., 1936.

Nematodes (*Tylenchus* spp. and *Aphelenchus avenae*) infesting two new species of rubber-bearing plants (*Taraxacum kok-saghys* Rodin and *Scorzonera tau-saghys* Lip. & Bos.) in the U.S.S.R. have been found to bear both in and on their bodies various bacteria, including *Bacillus carotovorus* and *Bacterium phaseolorum*, which were shown by inoculation experiments with pure cultures to aid the insects in the production of a destructive root rot.

Doran (W. L.). **Vinegar as a soil disinfectant.**—*Science*, N.S., lxxxiv, 2177, pp. 273–274, 1936.

Satisfactory control of damping-off (*Pythium*) [*de Baryanum*] and *Rhizoctonia* [?*Corticium solani*] in seed-beds of beet, cress (*Lepidium sativum*), and various ornamentals in Massachusetts was obtained by

the application to the soil of a dust containing about 23 per cent. acetic acid in a carrier of powdered wood charcoal, at the rate of 42 gm. per sq. ft. of surface. Good results were also given by the incorporation with sandy soils of four brands of commercial cider vinegar containing an average of 4·3 per cent. acetic acid, using ½ pint per sq. ft. of soil 3 in. deep, in beds sown with beet, lettuce, cabbage, tomato, and various ornamental seeds [cf. *R.A.M.*, xi, pp. 492, 589; xiii, p. 412; xiv, p. 7].

NOLL (J.). **Bodendämpfung. (Entseuchung des Bodens mit Dampf.)** [Soil steaming. (Soil disinfection with steam).]—*Kranke Pflanze*, xiii, 9, pp. 151–154, 1 pl., 1 fig., 1936.

The writer describes various types of steam apparatus (including the Pillnitz tip-wagon and upright, low-pressure boiler, and the Pillnitz soil-steaming column, Firma Buschmann, Lommatzsch) for large- and small-scale soil sterilization operations against fungi and other micro-organisms and soil exhaustion in Germany [*R.A.M.*, xi, p. 589; xii, p. 460], and gives concise directions for their use.

NATH (V.). **Disease resistance in plants in relation to nutrition balance.** —*Proc. Indian Acad. Sci.*, iii, 6, pp. 459–469, 1936.

A five years' investigation by the author in collaboration with T. L. Rao and M. R. Balakrishnan of a gradual deterioration of betel (*Piper betle*) vines accompanied by eelworm (*Heterodera radicicola*) [*H. marioni*] infestation and several fungi, including a *Rhizoctonia* [cf. *R.A.M.*, xiv, pp. 122, 718] which caused blackening and death of the stems, demonstrated conclusively that the diseased condition was due mainly to adverse soil factors. With improved soil conditions the yield became practically normal.

Analysis of the ash of leaves from six *Hevea* rubber trees suffering from abnormal leaf fall associated with *Phytophthora* [*meadii*: ibid., xiv, p. 123] showed the percentage potash content to range from 5·32 to 14·4 and from 20·7 to 26·76 for the healthy and infected leaves, respectively, the corresponding figures for periodical collections from the same trees being 10·9 to 12·6 and 19·0 to 25·4.

KRISHNASWAMI (C. S.). **Studies in disease resistance in crop plants in the Madras presidency. II. Estimation of disease resistance in Sugarcane mosaic.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 481–490, 1 graph, 1936.

Experiments carried out at Coimbatore showed the following sugar-cane varieties to be highly resistant to mosaic: P.O.J. 2878, Co. 214, 244, 315, 316, and 335, while Co. 355, 356, 412, and 413 are resistant [cf. *R.A.M.*, xv, p. 777]. Co. 360 and 361 appeared to show genuine recovery from infection as the plants grew older and inoculation tests indicated the development of a kind of immunity [loc. cit.]. Tests with Co. 205 from Pusa, where it is susceptible [ibid., x, p. 360], gave about 4 per cent. mosaic in the first year, presumably due to primary infection, but subsequently no further disease developed on this variety under Coimbatore conditions.

DUTT (N. L.), HUSSAINY (S. A.), & KRISHNASWAMI (M. K.). **A note on the breeding of Sugarcane varieties resistant to mosaic.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 425–431, 1 fig., 1936.

In investigations reported in this paper the authors found no support for the view that mosaic resistance is correlated with the presence of bristles on the leaves of sugar-cane [*R.A.M.*, vii, p. 475]. Coimbatore canes containing *Saccharum spontaneum* 'blood' were found generally resistant to or tolerant of mosaic.

BRANDES (E. W.). **Transmission of new types of Sugar-Cane mosaic and some observations on significance of the diseases.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 804–811, 1 fig., 1936.

With the sole exception of C.P. 807 all the sugar-cane varieties tested in Louisiana, including the tolerant varieties, have been found susceptible to Summers's strain 3 of mosaic [*R.A.M.*, xiv, p. 123], which causes a much more severe type of disease on commercially important varieties than the type familiar since 1919. Experiments [which are described in detail] begun in 1934 confirmed the menacing character of the disease, and indicated that vigorous steps will be necessary to bring it under control. Strain 3 proved to be readily transmissible by *Aphis maidis* from diseased to healthy sugar-cane, the inoculated plants showing disease symptoms after a minimum of 11 days. It was also demonstrated that Creole maize is susceptible, but developed different symptoms from those of sugar-cane: instead of the bold white stripes and early necrosis seen on the latter host, the maize plants exhibited a fine mottling of the inner leaves, similar to ordinary mosaic on Creole maize. In about a week, however, these slight symptoms faded, and the plants wilted and died. Needle-prick inoculations from the maize leaves, before wilting, into sugar-cane leaves resulted in very pronounced symptoms of strain 3 mosaic in 19 days. Further preliminary experiments made to determine the origin of this type of mosaic, and to ascertain whether the virus was stable or could be changed by simple manipulation, gave negative results.

The new form of the disease occurs, fortunately, in only a few localities, and in small amount. Eradication appears to be possible, but should not be relied upon entirely. Attention must be given to these new strains of the mosaic virus in future breeding work.

PEMBERTON (C. E.). **The insect vectors of virus diseases of Sugar-Cane.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 118–120, 1936.

The author suggests that *Perkinsiella vitiensis* is the vector of Fiji disease of sugar-cane [*R.A.M.*, xv, p. 320] in Fiji, where this insect is prevalent and, apart from the discovery of a single specimen of *P. saccharicida*, is the only species of *Perkinsiella* recorded for the Island. It is probable that several or all of the species may act as vectors of the disease, and a list is given of the known species of the genus and their geographical distribution.

The reported presence of streak disease [ibid., xv, p. 744] in

Mauritius, India, and Egypt suggests that in these countries species of *Cicadulina* other than *C. mbila*, found in South Africa, may be vectors.

Bell (A. F.). **Two inoculation methods.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 199–200, 2 figs., 1936.

A description is given of two forms of apparatus for rapidly inoculating large quantities of sugar-cane planting material in routine varietal resistance trials, without the necessity for immediate planting. The first, or 'pressure inoculator', consists of a cast-iron cylinder with a small, flanged, stainless steel cup fixed in the centre of the base, the upper rim of the cup being machined to a fine cutting edge bevelled outwards down to the flange. A suspension of the inoculum is poured into the cylinder, until the cutting edge of the cup is covered and by forcing the cut sett centrally and vertically downwards until stopped by the flange, the fluid in the cup is forced up through the vascular system of the sett. In the second, or 'stab inoculator', the cup is replaced by four stainless steel spikes, the sett being pressed down vertically on two or more of them. This apparatus has a slight advantage over the pressure inoculator as regards speed, and the treatment of thin or dried setts.

Cottrell-Dormer (W.). **The variability of plant pathogens.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 712–722, 2 figs., 1936.

In this paper the author discusses the practical significance of variability in plant pathogens in relation to crop improvement and protection, examples being taken from fungi, bacteria, and viruses, and a note added on cases of variation in varietal resistance to disease. In the course of a study of *Bacterium albilineans* [*R.A.M.*, xv, pp. 560, 607] sectors of two types were observed in giant and large colonies: A, smooth, almost hyaline, and usually growing rapidly, with the inner angle generally rounded, highly refractile, and showing a clear demarcation from the parent growth, and B, rough, fine to coarsely granular, growth rate varying but sometimes very slow and leading to the formation of distinct bights in the margin of the parent colony, and with the inner angle sharply and finely tapering into the parent growth, where it became lost. Very rough forms were smaller and more curved than the smooth forms; these last quite resembled the parent. In no instance did sectoring occur until three weeks after inoculation and all attempts to maintain the rough forms in a pure condition failed. Sectoring was also observed in colonies of the causal organisms of gumming [*Bact. vasculorum*: ibid., xv, p. 466] and mottled stripe [*Phytomonas rubrisubalbicans*: ibid., xi, p. 473]. From a general review of the subject it is concluded that every species of pathogen contains a number of more or less well differentiated strains, and that new genotypic forms arise from time to time in pathogens of all types.

Caminha (A.). **Sugar Cane diseases in Brazil.**—*Brasil Assuc.*, vii, 4, pp. 209–213, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 12, p. 471, 1936.]

The major sugar-cane diseases in Brazil [*R.A.M.*, xiv, p. 718] are gummosis [*Bacterium vasculorum*], mosaic, sereh [ibid., ix, p. 857;

xv, p. 317], and red stripe [*Bact. rubrilineans*: ibid., xv, p. 606]. The first-named was formerly very injurious to the Otaheite variety, but with the introduction of resistant canes it has practically disappeared, while mosaic has been largely suppressed by the cultivation of P.O.J. 36, 213, and 228 in the cooler subtropics. P.O.J. 979 is liable to show mosaic symptoms up to the age of four or five months, after which all signs of infection gradually disappear and by 12 to 14 months have been completely eliminated. P.O.J. 2878 is virtually immune from mosaic. A seedling, CB. 6032, has been developed combining resistance to both mosaic and sereh. Red stripe was first observed in Campos in 1931 and is very severe on P.O.J. 2727, whereas P.O.J. 979 and 105 and Co. 213, 281, and 290 are resistant or tolerant.

CAMINHA (A.). **Sugar Cane diseases in Brazil: II.**—*Brasil Assuc.*, vii, 5, pp. 289–290, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 11, p. 427, 1936.]

Among the minor diseases of sugar-cane in Brazil [see preceding abstract] are: 'round spot' (*Leptosphaeria sacchari*) [*R.A.M.*, xv, p. 606], to which P.O.J. 2714 is highly susceptible, while Kassoer seems to be virtually immune; 'long spot' (*Helminthosporium sacchari*) [ibid., xv, p. 462], on B.H. 10/12, D. 74 and 625, and P.O.J. 2878 and 2727; 'grey spot' (*H. stenospilum*) [ibid., xv, p. 606]; red sheath spot (*Cercospora vaginae*) [ibid., x, p. 777], very severe on P.O.J. 2727; and red sheath rot (*Sclerotium rolfsii*) [ibid., xv, p. 465], attacking young shoots in wet soils.

ABBOTT (E. V.). **Physiologic specialization in Colletotrichum falcatum Went.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 730–736, 3 figs., 1936.

In a further comparative study of 85 isolations of *Colletotrichum falcatum* [*R.A.M.*, xii, p. 724] two morphological groups were distinguished on the basis of the colour and texture of the mycelium, one being dark grey and velvety, and the other nearly white to light grey and cottony. The dark types were found almost exclusively in Mississippi, Georgia, and northern Florida, only the light ones in southern Florida, and both in Louisiana. With few exceptions, the light types were more virulent on P.O.J. 213 sugar-cane than the dark ones; the light ones from southern Florida were less virulent than most of the similar forms from Louisiana.

The light type L–31 showed a relatively high virulence on the resistant variety Co. 281, as compared with the other isolations [loc. cit.]. As, however, it did not always show the same high virulence on P.O.J. 213 when compared with a large number of isolates, it is doubtful whether it can be regarded as a separate physiologic form. So far this is the only established instance of an isolation of *C. falcatum* showing a preference for a certain sugar-cane variety, though others might be found if a sufficient number of differential hosts were used. Though there is evidence therefore of physiologic specialization in *C. falcatum*, proof is lacking that physiologic forms exist in the sense of those described for the cereal rusts. The light and dark types isolated might be regarded as varieties of *C. falcatum* but the differences in colony

appearance do not appear to be correlated with other morphologic characters. The author considers that *C. falcatum* constitutes a parallel case with *Pythium aphanidermatum* [ibid., xiv, p. 94] and that no sub-division of the species is warranted at present.

Brandes (E. W.), Dowell (C. T.), & Baker (R. L.). **C.P. 29/116 Cane in Louisiana.**—*Sug. Bull.*, xiv, 22, pp. 1–4, 1936. [Abs. in *Facts ab. Sug.*, xxxi, 11, p. 427, 1936.]

The cane variety C[anal] P[oint] 29/116 is recommended to Louisiana growers as a possible substitute on black lands and other secondary soils for Co. 290 [*R.A.M.*, xv, p. 826], should the latter not maintain its superior qualities. Both possess an adequate degree of vigour and resistance to root rot [chiefly *Pythium arrhenomanes*: ibid., xv, p. 826] while C.P. 29/116 appears to withstand mosaic better than 290, but is liable to red rot [*Colletotrichum falcatum*: loc. cit.; see also preceding abstract].

O'Connor (P.). **A contribution to knowledge of the Irish fungi.**—*Sci. Proc. R. Dublin Soc.*, xxi, N.S., 35–41, pp. 381–417, 1936.

This is a list of about 335 fungi found in the Irish Free State during the years 1932 to 1935.

Yamamoto (W.). **Cercospora-Arten aus Taiwan (Formosa) III.** [Species of *Cercospora* from Taiwan (Formosa) III.]—*Trans. nat. Hist. Soc. Formosa*, xxvi, pp. 279–286, 2 figs., 1936.

An annotated list is given of 16 species of *Cercospora* (4 new, with Latin diagnoses) collected on living foliage in Formosa during 1933–4 [cf. *R.A.M.*, xiv, p. 471], among which may be mentioned *C. atricincta* on *Zinnia elegans*, *C. buddleiae* n.sp. on *Buddleia madagascariensis*, *C. celosiae* on *Celosia cristata*, *C. ceratoniae* on *Ceratonia siliqua* [ibid., xii, p. 660], *C. cryptostegiae* n.sp. on *Cryptostegia* sp. imported from India, *C. hydrangeana* on *Hydrangea angustipetala* Hayata and *H. macrophylla*, *C. punicae* on pomegranate [ibid., ix, p. 613], and *C. viridula* on *Ipomoea indica*.

Danelia (B. K.). Болезни Чайного куста в условиях Западной Грузии. [Diseases of the Tea bush in Western Georgia.]—*Sovetsk. Subtrop.*, *1936*, 8 (24), pp. 56–61, 6 figs., 1936. [English summary.]

Out of a total of some 40 species of fungi found living on the tea bush in Western Georgia [Transcaucasia] the most widespread and economically important are stated to be *Colletotrichum camelliae* [*Glomerella cingulata*: *R.A.M.*, xvi, p. 1], *Cercoseptoria theae* [ibid., xiii, p. 129], and *Pestalozzia theae* [ibid., xv, p. 521]. The author suggests that all of these organisms should be easily controlled by improved cultural practices and by spraying the bushes with Bordeaux mixture. A serious wilt, associated with various fungi, frequently kills up to 15 per cent. of the tea seedlings.

Gadd (C. H.). **Diseases of the Tea bush. III. Root diseases and tree stumps.**—*Tea Quart.*, ix, 3, pp. 101–107, 1936.

In this further paper on tea diseases [cf. *R.A.M.*, xv, p. 747] the author discusses the spread of root diseases from dead stumps. In

Ceylon the pathogenic fungi normally associated with dead tree stumps are *Fomes noxius* and *Ustulina zonata*; *Poria hypolateritia* and *Rosellinia arcuata* [ibid., xv, p. 686] rarely originate on stumps in old tea. The cost of removing all stumps from a new clearing is considered prohibitive and consequently appropriate measures must be taken when outbreaks of root disease occur; where the latter two diseases are predominant the removal of all stumps has relatively little significance, whereas if the former two are prevalent it is important. The danger involved from very old stumps is probably negligible.

Van der Weij (H. G.). **De bodem als infectiebron van Rotterdam-B disease.** [The soil as a source of infection by Rotterdam B disease.] —*Vlugschr. Deli-Proefst. Medan*, 61, 6 pp., 1936.

Conclusive evidence was afforded by experiments undertaken in consequence of a serious outbreak of Rotterdam B disease among newly planted tobacco in Serdang, Sumatra, in which up to 70 per cent. infection spread to adjacent plantings within 11 days, that the virus may be conveyed from one site to another through the soil [*R.A.M.*, xv, p. 686]. Like mosaic, Rotterdam B disease is transmissible from infected to healthy plants by the hands of workmen, and the task of dealing with infested plots should therefore be assigned to special individuals, who should wash their hands in a 5 per cent. formalin solution before proceeding to other work. Seed-beds containing infected plants should be cleared away, together with the surrounding beds, but where sporadic cases appear in the field it is sufficient to eradicate the diseased plants themselves; in the event of mass infection in the plantation, however, total eradication and replanting are indicated.

Holmes (F. O.). **Comparison of derivatives from distinctive strains of Tobacco-mosaic virus.**—*Phytopathology*, xxvi, 9, pp. 896–904, 1 fig., 1936.

Yellow mosaic strains isolated from 31 Turkish tobacco plants previously infected with the distorting strain virus [*R.A.M.*, xv, p. 533] showed considerable variations in 'invasiveness' (capacity to invade and affect the younger leaves of infected plants) and other characters. Thus, 23 out of the 31 may be described as fully invasive, systemic, yellow-type strains, capable of puckering the young leaves and distorting the tips of those at the top of the plant at the time of the onset of mottling. Another five strains produced systemic infections, but did not cause puckering or distortion, while three caused localized symptoms only. Thirteen out of 22 yellow-type strains isolated from tobacco plants infected by the masked strain virus [ibid., xvi, p. 66] were capable of systemic spread through the same host, but none showed a high degree of invasiveness. In general, the invasiveness of the yellow strains derived from the masked strain virus underwent no change during the processes of reisolation and storage in cellophane tubing. The extent to which virus strains transmit their characters to variants arising from them is not known, but in this case the uninvasive character of the masked strain (manifest at its isolation from the

invasive distorting strain) was retained by the yellow type derivatives from it. Changes to yellow mosaic type and to invasive type appear to be independent and may be comparable with unit differences in genetic structure of plants and animals.

KLEBAHN (H.). **Versuche über das Wesen der Mosaikkrankheit des Tabaks und über einige andere Viruskrankheiten.** [Experiments on the nature of the mosaic disease of Tobacco and on some other virus diseases.]—*Phytopath. Z.*, ix, 4, pp. 357–370, 2 figs., 1936.

The fact that cyanic acid, potassium cyanide, silver nitrate, ether, and chloroform failed to weaken two samples of the tobacco mosaic virus to which they were applied in appropriate concentrations in tubes, whereas the bacteria in the solutions were destroyed, is considered to favour the theory that the former is an inanimate substance such as an enzyme [*R.A.M.*, xi, p. 256; xvi, p. 69]. After three years the samples were capable of infecting tobacco plants.

Negative results were given by attempts to induce chlorosis in green *Abutilon sellovianum* plants by contact with variegated *A. striatum* or *A. thompsoni*, union being effected by clamping together the cut surfaces of the stems for six days; in previous tests a successful outcome was obtained by five or six repetitions of the operation at six- to seven-day intervals [ibid., xi, p. 257].

Positive results were obtained in the inoculation of anemones with an extract of the soil adhering to the rhizomes of plants suffering from alloiophylly [loc. cit.], as well as with the powder from dried leaves.

A mosaic disease of cucumber (records of which from Germany could not be traced) [but see ibid., xiii, p. 416] was observed near Hamburg in July, 1934, and was shown by inoculations on four plants (two of the Spot Resisting variety and one each of Blaus Erfolg and Deutscher Sieger) to be transmissible by sap.

BENINCASA (M.). **Il marciume radicale del Tabacco.** [Root rot of Tobacco.]—*Boll. tec. Tab.*, xxxiii, 3, pp. 111–114, 5 figs., 1936. [English summary.]

The writer summarizes the position with regard to the occurrence and control of root rot of tobacco (*Thielavia* [*Thielaviopsis*] *basicola*) in Italy [*R.A.M.*, xiii, p. 276; xv, p. 613], whence it was first reported in 1897. The principal remedies against root rot consist in the establishment of seed-beds on such naturally sterile soils as pozzolana (volcanic ash) or sand, or on burnt field soils, and the cultivation of resistant varieties, such as Salento, Meticcio di Cava, Giant Kentucky, and Moro di Pontecorvo (Kentucky types), Guiseppina and Burley di gran reddito [heavy-yielding], corresponding to the recently introduced Burley, and Marca B (Virginia Bright).

PITTMAN (H. A.). **Downy mildew (blue mould) of Tobacco and its control by means of benzol and other volatile hydrocarbons.**—*J. Dep. Agric. W. Aust.*, xiii, 2nd Ser., 3, pp. 368–380, 4 figs., 1936.

In the first part of this paper the author gives a concise account of the symptoms and economic importance of downy mildew of

tobacco (*Peronospora tabacina*) [*R.A.M.*, xvi, p. 65] in Western Australia, together with a brief reference to the Australian experiments on the control of the disease by benzol and toluol vapours in covered seed-beds [ibid., xv, p. 756]. In the second part details are given of experiments in 1935–6 which were carried out at Manjimup and in the Fremantle area, Western Australia, in which the action was tested of benzol, petrol, and X3 Solvent, the last-named being a benzol substitute (with boiling-point between 90° and 110° C.), marketed by the Shell Oil Co. of Australia. In spite of the very rainy season, no trace of the disease was observed in the covered beds that had been treated with any one of the three hydrocarbons, whereas the seedlings in most of the control beds were entirely destroyed by the fungus which, at Manjimup, had been artificially introduced into both the treated and untreated seed-beds. The vigour and uniformity of the seedlings from the treated beds were in marked contrast to those of the untreated plants and this superiority was maintained right up to harvesting, even though downy mildew was abundant in the field.

KRETCHMAR (H. H.). **An apparatus for the application of benzol to Tobacco seed-beds.**—*J. Dep. Agric. W. Aust.*, xiii, 2nd Ser., 3, pp. 380–383, 1 diag., 1936.

The author briefly describes and figures an apparatus for rapidly and easily filling the containers placed in tobacco seed-beds with benzol, for the control of downy mildew of tobacco [*Peronospora tabacina*: see preceding abstract]. The benzol is delivered from the container through a ball release operated by a plunger from the top. In an experimental trial it was found possible to fill 50 seed-bed containers in five minutes, without the operator having to stoop.

WEST (J.). **Leaf curl of Tobacco in Southern Nigeria.**—*Trop. Agriculture, Trin.*, xiii, 9, pp. 242–244, 5 figs., 1 graph, 1 map, 1936.

Tobacco leaf curl [*R.A.M.*, xv, p. 425], first recorded in Nigeria on experimental plots of Virginian tobacco in 1923, practically ruined a crop planted out early in June, 1935, though a late crop in the same year averaged under 1 per cent. infection. In inoculation experiments by means of the tobacco white fly [*Bemisia* sp.] carried out in collaboration with F. D. Golding, adults from diseased tobacco were fed on five seedlings grown singly in tins containing soil not sown to tobacco for ten years and covered with lamp glasses, four of the seedlings being inoculated with 25 adults each and one with 50. Each of the five inoculated plants showed typical symptoms after one month, though the seven controls remained unaffected. Attempts to inoculate healthy *Vernonia* [ibid., xv, p. 118] cuttings were unsuccessful.

In south-western Nigeria, the native method of growing tobacco during the late rains gives sound control of leaf curl, as the white fly population has begun to decline rapidly by the time the seedlings are transplanted. Infection can, therefore, be serious only in the nursery, where, at present, it appears to be absent. If a more intensive cultivation is undertaken in this locality, the precautions advocated in East Africa will probably have to be adopted [ibid., xiv, p. 678].

Goidànich (G.). **Ricerche sulle 'Phytophthorae' del Pomodoro. I. La Phytophthora parasitica Dast. sul Pomodoro.** [Researches on species of *Phytophthora* attacking Tomato. I. *Phytophthora parasitica* Dast. on Tomato.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 115–138, 1 pl., 14 figs., 1936.

This account of the author's investigations into the tomato collar rot caused in Italy by *Phytophthora parasitica* is an expanded version of a paper already noticed from another source [*R.A.M.*, xv, p. 691]. A sterile variant of the fungus proved much more virulent than the original strain.

Goidànich (G.). **Comportement parasitaire particulier de la 'Phytophthora infestans' De By.** [Abnormal parasitic behaviour of *Phytophthora infestans* De By.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 9, pp. 165–168, 1936.

During the spring of 1936, tomatoes growing in different parts of central Italy developed stem infection by *Phytophthora infestans* on an epidemic scale. Early in May, a scorched lesion appeared, almost invariably in the upper half of the stem, which was girdled by affected tissues, resulting in the rapid dying-off of the tops of the plants. Before the plants withered, the mycelium progressed along the petioles and produced injury similar to that on the stems, the affected leaves wilting at once. Frequently the initial attack occurred at the top of the plant, destroying the buds and affecting flowering. The diseased parts were covered by a white, shining mycelium with numerous zoosporangia, and all the affected tissues were completely invaded. No lesions appeared on the leaf margins. The author considers that the unusual site of the infection indicates that the fungus was in all probability a physiologic form quite distinct from that which attacks the leaves [cf. *R.A.M.*, xv, p. 405]. Further investigations are to be made to elucidate this point.

Huelsen (W. A.). **New wilt-resistant Tomato varieties for field and greenhouse.**—*Circ. Ill. agric. Exp. Sta.* 448, 20 pp., 8 figs., 1936.

Notes are given on the origin, productivity and other characters, and uses of eight tomato varieties resistant to wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*] bred at the Illinois Agricultural Experiment Station during the last ten years [*R.A.M.*, xiii, p. 218] and recently released to the public. Three (Prairiana, Early Baltimore, and Illinois Pride) are suitable for the field, and the other five (Blair, Sureset, Urbana, Lloyd, and Long Calyx) for the greenhouse only.

Doolittle (S. P.) & Alexander (L. J.). **Injury to greenhouse Tomatoes as a result of combined infection with the viruses causing Tomato and Cucumber mosaic.**—*Phytopathology*, xxvi, 9, pp. 920–923, 2 figs., 1936.

Greenhouse tomatoes in Ohio and Colorado were severely damaged in 1935 by a disease due to combined infection with ordinary tomato mosaic (Johnson's tobacco virus 1) [*R.A.M.*, xv, pp. 181, 532] and cucumber mosaic (Doolittle's cucumber virus 1) [cf. ibid., xiv, pp. 473, 534], the losses from which amounted to thousands of dollars. The plants were abnormally short (3 to 4 ft.) on 30th May, some six months

after planting, and compact, the leaves just below the growing point being characterized by an upright, bushy habit, due in part to very short internodes and partly to an excessively twisted and erect development of the petioles. The young leaflets were curled, distorted, thick, with yellow veins, and occasionally showed the filiform 'shoestring' malformations liable to affect tomatoes attacked by cucumber mosaic, while the older ones were sharply rolled upwards at the margins and exhibited a mild, yellowish-green mottling similar to that caused by ordinary tomato mosaic. Many of the leaves were of a peculiar greenish-purple, especially along the veins and on the under side, while some also showed large, yellow, bleached-looking spots and a russet-coloured necrosis bordering the larger veins. The flowers were commonly malformed and abortive, but some fruit was produced which was deeply ridged and when small showed a characteristic pointed protuberance at the blossom end.

Tomato plants inoculated with juice from diseased material developed the typical symptoms of the combined virus disease as described above. The cucumber virus was readily separated from the accompanying tobacco virus by direct inoculations on cucumber, and the latter virus was separated from the former by heating to 82° C. In Ohio the cucumber mosaic infection was traced to a neighbouring field of muskmelon [ibid., xiv, p. 811], while in Colorado it apparently originated on cucumbers in another part of the greenhouse. Aphids seem to have been present in large numbers in both States.

BEST (R. J.). **Studies on a fluorescent substance present in plants. I. Production of the substance as a result of virus infection and some applications of the phenomenon.**—*Aust. J. exp. Biol. med. Sci.*, xiv, 3, pp. 199–213, 5 figs., 1936.

When a Blue Pryor tobacco leaf with primary lesions of tomato spotted wilt [*R.A.M.*, xv, p. 404] is examined under filtered ultra-violet light from a quartz mercury-vapour lamp with a range between 3,000 and 4,200 Å, the affected areas are seen to be surrounded by brightly fluorescent haloes extending into the apparently healthy green mesophyll and spreading radially outward as the spot develops. The fluorescence is caused by a water-soluble, relatively stable organic substance present in small amounts as a normal constituent of healthy tobacco plants but produced in much larger quantities as a result of virus activity.

Systemic invasion of inoculated tobacco leaves by the spotted wilt virus is shown by bright fluorescent areas, and the effect has been applied to trace the movement of the virus in the leaf. The virus appears to travel to the leaf by way of the vascular bundles, into the mid-rib, along the lateral veins, thence into the smaller veins, and ultimately out into the mesophyll.

The fluorescent substance was also produced round primary tobacco mosaic lesions, spotted wilt lesions on *Nicotiana glutinosa*, *Petunia hybrida*, potato leaves, and occasionally on tomato leaves, but never on nasturtium (*Tropaeolum majus*) leaves [cf. ibid., xv, p. 444]. A close parallel seems to exist between the abundance of the fluorescent substance in healthy plants and the severity of spotted wilt infection.

Tobacco plants systemically infected with ordinary mosaic show only a faint fluorescence in the pale green areas of mottled leaves, while tomato foliage similarly infected does not contain the substance in demonstrable amounts. The fluorescent reaction was experimentally shown to develop in plants injured in various ways, and is therefore not specific for the tomato spotted wilt virus.

BEST (R. J.). **The effect of light and temperature on the development of primary lesions of the viruses of Tomato spotted wilt and Tobacco mosaic.**—*Aust. J. exp. Biol. med. Sci.*, xiv, 3, pp. 223–239, 6 graphs, 1936.

Under constant conditions of light and temperature, the curves relating the number of tomato spotted wilt and tobacco mosaic lesions [see preceding abstract] on Blue Pryor tobacco and *Nicotiana glutinosa*, respectively, to time were found to be sigmoid and to approach limiting values. The limiting value for both virus-host combinations was 30 per cent. higher at 20° than at 15° C. when the light factor was kept constant. The time interval between inoculation and the time of maximum rate of appearance of lesions varies with temperature, and at constant temperature appears to be a constant for any one virus-host combination. The interval was found to be 50 per cent. longer at 15° than at 20° for mosaic lesions on *N. glutinosa*, and 60 per cent. longer for spotted wilt lesions on tobacco. The time taken by the spotted wilt lesions to attain their maximum rate of appearance was 60 per cent. longer than that for mosaic at 20° and 50 per cent. at 15°. Sunlight, and to a much slighter extent, artificial light, exerted an inhibitory action on the development of spotted wilt lesions on tobacco.

WHIPPLE (OTIS C.). **Spotted wilt of Garden Pea.**—*Phytopathology*, xxvi, 9, pp. 918–920, 1 fig., 1936.

The inoculation of expressed juice from peas affected by streaking of the stems and a spotted brown necrosis of the leaves in a greenhouse at Wisconsin University in 1934 into tobacco, tomato, aster [*Callistephus chinensis*], nasturtium [*Tropaeolum majus*], *Nicotiana glutinosa, Datura stramonium*, and *Emilia sagittata* induced typical symptoms of tomato spotted wilt [see preceding abstracts]. Characteristic streak [*R.A.M.*, xi, p. 218] symptoms developed in 12 out of 18 Yellow Admiral pea plants inoculated by rubbing with juice from Calla lily [*Zantedeschia aethiopica*] leaves from California infected by spotted wilt [ibid., xiv, pp. 212, 725], and in 4 out of 16 inoculated by Stubbs's tissue-insertion method [ibid., xv, p. 551], the use of a carborundum abrasive [ibid., xv, p. 737] greatly facilitating infection. Of 105 Yellow Admiral, Alaska, and Alderman plants inoculated by rubbing, 33 showed typical streak symptoms. Of 192 healthy pea plants to which infective individuals of *Thrips tabaci* were transferred from two lots of nasturtiums, one infected by streak and the other by spotted wilt, 43 contracted streak in a typical form and all six attempts to recover the virus from the diseased plants were successful. Seventeen out of 27 pea blossoms on which viruliferous insects were caged set pods, and symptoms developed on six, from which the virus was readily reisolated.

Under the conditions of these tests the incubation period of the virus ranged from 7 to 20 days. The stem streak is purplish- or bluish-brown and may extend only slightly beyond the point of inception or cover the whole length of the stem. A histological examination of infected stems revealed general necrosis of the parenchymatous cells, including the phloem. Unilateral development of the affected parts is common, and other symptoms include an occasional mottling of young leaves, irregular, wavy, concentric patterns over the necrotic areas of the pods, associated with *Thrips* feeding, and rarely necrotic spots or patterns on the seeds.

The spotted wilt virus, being widely distributed, is thought to be undoubtedly a causal factor in pea streak. Symptoms resembling those described above were observed in the field at Madison in 1935 on pea plants artificially inoculated with the spotted wilt virus, which was further recovered from badly diseased plants in a streak epidemic in two widely separated nurseries in the same year.

MEIER (K.) & GRAMPOLOFF (A. V.). **L'action des rayons ultra-violets sur l'entreposage des denrées périssables.** [The action of ultra-violet rays on the storage of perishable commodities.]—*Annu. agric. Suisse*, xxxvii, 9, pp. 951–977, 4 figs., 11 graphs, 1936. [German summary.]

Cultures of *Cladosporium lycopersici* Plowr., *Botrytis cinerea*, and *Penicillium glaucum* isolated from tomato fruits were generally destroyed by 12, 10, and 40 minutes' exposure, respectively, to ultra-violet rays generated by a mercury-vapour lamp 'Gallois', with continuous current, Henri George burner, 220 volts, 2·5 ampères, at a distance of 21 cm. In certain instances, however, even longer durations of illumination failed to sterilize the cultures, probably on account of the presence of buried spores in the agar. Discontinuous irradiations were less potent than a single exposure of the requisite duration. Tomatoes inoculated with the above-mentioned fungi were similarly exposed, with the result that the growth of *P. glaucum* was completely arrested after 40 minutes irradiation, while that of *C. lycopersici* was only retarded after 15 to 20, and the internal development of the mycelium of *B. cinerea* precludes absolute sterilization.

A series of experiments are described on the effect of irradiation on the storage of fresh fruit the results of which showed that the treatment consistently reduced the rotting due to micro-organisms. In one experiment with tomatoes, for instance, irradiation for 30 seconds and 1 minute of each tomato each day reduced rotting (by *B. cinerea* and *C. lycopersici*) from 11·2 per cent. in the untreated control to 6·2 and 6·3 per cent., respectively, after 17 days, and from 97·5 to 76·8 and 63·0 per cent. after 43 days. In another similar experiment irradiation for 1 minute 7 seconds per day per tomato reduced loss (chiefly from *C. lycopersici*) from 14·8 to 7·2 per cent. after 20 days storage, and from 65·8 to 43·4 per cent. after 31 days. The incidence of *B. cinerea* on strawberries was diminished by discontinuous irradiation for 4 minutes 15 seconds each day, the best result being given in the variety '7/2' in which the loss after 16 days was 9 per cent. as against 61·9 per cent. in the control. The invasion of peaches by *Monilia* [*Sclerotinia*],

Penicillium, and *Clasterosporium* [?*carpophilum*] was similarly reduced by treatments for 5 minutes 40 seconds each day, from 28·9 per cent. rotted after 22 days to 13·1 and 9·0 per cent. (in two sets of fruit) and from 59·2 to 36·8 and 41·5 per cent., respectively, after 45 days.

HIRT (R. R.). **Observations on the production and germination of sporidia of Cronartium ribicola.**—*Tech. Publ. N.Y. St. Coll. For.* 46, 25 pp., 8 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxv, 4, p. 508, 1936.]

Under the meteorological conditions prevailing at Warrensburg, New York, teleutospore age was found to affect sporidium production in *Cronartium ribicola* [*R.A.M.*, xvi, p. 74]. Direct contact with water was not essential for, though highly stimulatory to, teleutospore germination, but relative humidities of 96 to 100 per cent. were necessary at 12° to 16° C. From 12° to 18° was the optimum range for sporidial production, the minimum and maximum being 0° to 1° and 21°, respectively. The teleutospores were still viable after eight hours' exposure to direct sunlight, but the time required for sporidial formation was increased. Sporidia were expelled with sufficient force to carry them for an average horizontal distance of 266 μ. Germination was effected both by the production of secondary sporidia and by the development of true hyphae, the particular type being largely determined by temperature. Direct sunlight affected the sporidia adversely, but otherwise they remained viable for eight hours on warm, clear days under natural conditions.

GROVES (J. W.). **Ascocalyx abietis and Bothrodiscus pinicola.**—*Mycologia*, xxviii, 5, pp. 451–462, 1 pl., 2 figs., 1936.

The author states that in 1934 *Ascocalyx abietis* [*R.A.M.*, v, p. 520] was collected on lower dead branches or fallen trees of *Abies balsamea* in the Temagami Forest Reserve, Northern Ontario, in close association with fruiting bodies of *Bothrodiscus pinicola* Shear, and that the genetic connexion of these two fungi was established in pure cultures. In a taxonomic discussion good evidence is adduced showing that *A. abietis* is closely related to *Crumenula abietina* [ibid., xii, p. 667] and *C. pinicola* [ibid., xv, p. 618], but it is thought inadvisable to transfer it to *Crumenula* on account of the uncertain status of this genus. It would appear that the nomenclatural type of *Crumenula* is not congeneric with *C. pinicola* and related species, and that, therefore, the name *Ascocalyx* is valid for the fungus studied by the author, and probably also for the species included in *Crumenula* in the sense of Rehm, who considers *C. pinicola* as the type. Revised descriptions are given, based on Canadian material, of *A. abietis* and its imperfect stage which has also been known as *Fusisporium berenice* Berk. & Curt. 1875, *Cenangium pithyum*, *Scleroderris pitya*, and *Pycnocalyx abietis*.

SHEAR (C. L.) & DAVIDSON (R. W.). **The life histories of Botryosphaeria melanops and Massaria platani.**—*Mycologia*, xxviii, 5, pp. 476–482, 5 figs., 1936.

The authors report the occurrence of *Botryosphaeria melanops* on red

oak (*Quercus borealis*) in 1935 in Connecticut, a new record for the United States, and single ascospore cultures showed *Dothiorella advena* Sacc. to be the imperfect stage. *Massaria platani* Ces. was found in Washington, D.C., fruiting abundantly around a branch stub on a sycamore tree [*Platanus occidentalis*] while *Hendersonia desmazieri* Mont. developed freely on the outer edges of a diffuse canker on the stem of the same tree. The genetic relationship of the two stages was established by the fact that single ascospore cultures of the former produced pycnospores of the latter after five to seven weeks growth on malt agar at about 24° C. The pycnospores thus produced were more irregular in shape and size than those produced in nature, which were 4-celled and measured 44 to 52 by 17 to 20 μ. The ascospores of *M. platani* were mostly 6-celled and 58 to 68 by 14 to 16 μ.

CAMPBELL (A. H.) & MUNSON (R. G.). **Zone lines in plant tissues. III. The black lines formed by Polyporus squamosus (Huds.) Fr.**—*Ann. appl. Biol.*, xxiii, 3, pp. 453–464, 2 pl., 1936.

Polyporus squamosus [*R.A.M.*, xv, p. 620], a wound parasite of dicotyledonous trees, with apparently little power of direct attack on living wood, was isolated from black lines inside the wood of an elm, near Bristol, bearing sporophores of the fungus. In culture on artificial media it formed loose, cottony aerial mycelium with marked aggregations of hyphae which developed into whitish-yellow pseudoparenchymatous papillae 0·5 to 1·5 by 0·3 to 0·6 mm., usually in rows between the agar and the glass. The function of the papillae is unknown. Black plates, or lines as they appear in section, were observed after five or six weeks and were produced by the fungus in sterilized blocks of poplar, sycamore [*Acer pseudoplatanus*], pear, elm, beech, ash, and oak wood. In a discussion of the structure and formation of these lines, it is suggested that, as in the case of *Armillaria mellea* [ibid., xiii, p. 483], they form the limiting layer or rind of sclerotium-like bodies (pseudosclerotia) buried in the attacked wood. Club-shaped bodies interpreted as abnormal fructifications occurred in culture on wood blocks on which oidia were also produced by fragmentation of the hyphae into chains of cells 8 to 30 by 4 to 10 μ in diameter. The paper terminates with a review of the formation and structure of sclerotia in several species of *Polyporus*, which are compared with the pseudosclerotia of *P. squamosus*.

HOPP (H.). **Appearance of Fomes igniarius in culture.**—*Phytopathology*, xxvi, 9, pp. 915–917, 1936.

Out of 50 cultures of *Fomes igniarius* [*R.A.M.*, xv, pp. 63, 199] from decayed wood of *Populus tremuloides*, 41 stained the malt agar deep mummy-brown and produced little or no aerial mycelium, while the remaining nine induced a more or less conspicuous bleaching of the medium and formed a profuse antimony-yellow to Dresden-brown aerial mycelium. Homothallic cultures derived from mycelium growing in wood and from spores also produced both types of growth. No indication was afforded of any genetic differences between the two types and the factor implicated remains unknown.

SASTRI (B. N.). **Physiology of the spike disease of Sandal.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 444–449, 1936.

Reviewing the biochemical data existent on the spike disease of sandal [*R.A.M.*, xiv, p. 802] the author concludes that in affected plants the equilibrium between starch and its products of hydrolysis is disturbed; the products of hydrolysis accumulate and this leads to the accumulation of starch. The disappearance of nitrates after the attack has not yet been explained; it is suggested that they may be reduced to nitrates, which at once react with amino-acids, to produce hydroxy acids. Succinic, malic, and oxalic acids [ibid., xiv, p. 538] and mannitol (of which the last has not been recorded in any other virus-affected plant) are present in spiked leaves as a result of changed respirational activity, the oxygen uptake being about half, and the oxidase and peroxidase activities about double, those of healthy leaves. The accumulation of these acids is due to the small calcium concentration of the affected tissue, which hinders their neutralization or removal by precipitation.

HILBORN (M. T.). **The calorific value of decayed cordwood.**—*Phytopathology*, xxvi, 9, pp. 905–914, 1 graph, 1936.

The effect of fungal decay, due to *Polyporus* [*Polystictus*] *hirsutus* [*R.A.M.*, xii, p. 740], *P. pergamenus* [ibid., xvi, p. 4], *Panus stipticus* [ibid., xiv, p. 270], *Stereum purpureum* [ibid., xvi, p. 3], *Thelephora* sp., and *Daldinia* sp., on the specific gravity and calorific value of red maple (*Acer rubrum*), paper birch (*Betula* [*alba* var.] *papyrifera*), and beech (*Fagus grandifolia*) [*F. ferruginea*] in two situations (woods and open field) in Maine was measured over a four-year period with the object of testing whether calorific determinations can be utilized in evaluating fungal decay. The specific gravity and calorific value of the wood (air-dried) showed a parallel decline, denoting a change in chemical composition. Correcting the calorific value for water-content, which increased with the extent of decay, the net fuel value was found to decrease during the four-year period by up to 89·4 per cent. for the unsplit birch from the woods compared with only 35·9 per cent. for the unsplit red maple from the field. Some of the birch wood showed a decline of 50 per cent. of the fuel value in less than two years.

Red-flowered Gums. Control of canker disease.—ex *W. Australian*, 17 September, 1936.

In this summarized report on investigations carried out in Western Australia by H. A. Pittman on the cause and control of canker disease of red-flowered gums [*Eucalyptus ficifolia* and *E. calophylla*] it is stated that the causal organism has been isolated, and that numerous inoculation experiments carried out during a period of two years with this fungus leave no doubt as to its being the cause of the disease. In every case the inoculated trees became infected while the uninoculated remained healthy, many of the former succumbing in six months. A very few resistant types were found, and it is considered that in future only such trees should be planted. Pending the discovery of methods of vegetative propagation, it is recommended that badly affected trees

should be destroyed by burning, and all infected parts removed from trees otherwise healthy, the wounds made being painted with Bordeaux paste or thick white lead. The stems and leaves of young trees planted near older, diseased ones should be sprayed several times during the wet season (on fine days) with home-made Bordeaux mixture 4–4–50.

SCHEFFER (T. C.). **Progressive effects of Polyporus versicolor on the physical and chemical properties of Red Gum sapwood.**—*Tech. Bull. U.S. Dep. Agric.* 527, 46 pp., 2 pl., 1 fig., 12 graphs, 1936.

A detailed study of the decay of red gum (*Liquidambar styraciflua*) sapwood caused by *Polyporus* [*Polystictus*] *versicolor* [*R.A.M.*, x, p. 149 and above, p. 106] showed that the fungus caused a uniform thinning of the cell walls, indicating the production of enzymes capable of affecting the wood substance in advance of the hyphae. The characteristic bleaching effect was found to be due to a destruction of semi-soluble pigments.

Reduction in the specific gravity of the wood was delayed 8 to 10 days after inoculation, but subsequently losses in weight were largely proportional to the length of the incubation period. The effect of the decay was initially to lower all the strength properties listed (except those indicated by modulus of elasticity, fibre strength at, and work to, proportional limit) more rapidly than the specific gravity. The three tests excepted were tardy in responding to the decay, making trends in early losses obscure. After the initial stages of decay had been passed, all the strength properties were reduced more rapidly than the specific gravity. The values for all of them approached zero considerably in advance of the point of complete wood consumption, and were, for the most part, lower than those of sound wood of the same specific gravity. As indicators of incipient decay, work to maximum load and total work beyond maximum load were outstanding. The most dependable indicators of extent of decay were modulus of rupture and maximum crushing strength.

The chief effects on chemical composition were as follows. The relative proportions of the principal wood components were not materially altered. The lignin, pentosans not in cellulose, cold water-soluble, and 1 per cent. alkali-soluble components were first attacked, while the Cross and Bevan cellulose, pentosans in cellulose, and strictly hot water-soluble portions remained little affected until part of the wood substance had been consumed. In the earlier stages of decay the cellulose depletion was represented by losses in both the stable and unstable forms, while in the latter the stable cellulose consumption was more pronounced.

It is suggested that the initial reduction in strength was due to the removal or alteration of small amounts of cell wall lignin and soluble carbohydrates which had cemented the fundamental cellulose units together.

LOHWAG (A.). **Mykologische Studien. XI. Poria obliqua (Pers.) Bres.** [Mycological studies. XI. *Poria obliqua* (Pers.) Bres.]—*Öst. bot. Z.*, lxxxv, 4, pp. 270–278, 6 figs., 1936.

In these further studies the writer describes and discusses the morphological features of *Poria obliqua*, found on a maple in the Vienna

Botanic Garden [*R.A.M.*, xv, p. 329], comparing his observations with those of von Höhnel on the same fungus and tracing analogies between *P. obliqua* and other Polyporaceae. The author has constantly detected *P. obliqua* on the trunks of thoroughly sickly trees and doubts its capacity to initiate decay.

RICCARDO (S.). **Secondo contributo sperimentale per lo studio delle alterazioni interne delle Castagne.** [A second experimental contribution to the study of internal spoilage of Chestnuts.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno (Portici)*, v, pp. 1–14, 2 pl., 1936.

Continuing his investigation into the infection of chestnuts destined for export [*R.A.M.*, xiv, p. 801], the author found that after the hot-water treatment some developed mould (*Penicillium glaucum*) on the external surface of the pericarp. Many chestnuts with soft, blackish flesh showed, in addition, internal infection by a fungus whose chief characters agreed with those of *Rhizopus nigricans*. The internal spoilage of chestnuts with white, soft, and cheesy flesh appeared to be due principally to an apparently undescribed species of *Micrococcus* and a bacterium of the *Bacterium* [*Bacillus*] *coli commune* group. The water used for treating chestnuts almost constantly contained yeasts and frequently showed the presence of bacteria of the *B. coli commune* group.

SERVAZZI (O.). **Nuove ricerche sulla preservazione dalle muffe delle Castagne disinfestate con la immersione in acqua a 50° C. per 45 minuti.** [New researches on the preservation from moulds of Chestnuts disinfected by immersion in water at 50° C. for 45 minutes.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 3–4, pp. 31–45, 1936.

Further investigations are described into the various factors affecting mould formation on or in Italian chestnuts submitted to hot-water treatment before export [see preceding abstract]. On the basis of inoculation experiments through various types of wounds with *Penicillium crustaceum* the author concludes that lesions made during harvesting, selecting, washing, and drying have no effect on mould development, since these do not penetrate the whole thickness of the pericarp. Immersion in cold water for 24 to 72 hours before applying the hot-water treatment did not improve the keeping qualities of the chestnuts.

Investigations on the chemical nature of the flesh of different varieties failed to reveal any relationship between composition and mould resistance. It was ascertained that immersion in water at 50° C. for 45 minutes stimulated the enzymatic processes and altered the carbohydrate : nitrogen ratio of the chestnuts; this, it is considered, must exercise an adverse effect on resistance to infection.

MONTGOMERY (H. B. S.). **A study of Fomes fraxineus and its effects in Ashwood.**—*Ann. appl. Biol.*, xxiii, 3, pp. 465–486, 1 pl., 4 figs., 1 graph, 1936.

After noting the hosts on which *Fomes fraxineus* [*R.A.M.*, vi, p. 200] has been recorded in literature, the author gives a tabulated account of morphological and physiological studies of a strain of the fungus

isolated from a living locust (*Robinia pseud-acacia*) tree in England. In pure culture on malt agar *F. fraxineus* developed a snow-white growth, which later became pale pinkish-brown and then wood-brown, and after three weeks bore pore-surfaces sometimes extending almost over the whole of the culture. The aerial hyphae were about 2 μ in diameter, and the submerged, septate hyphae with many clamp-connexions varied in diameter from 1 to 4 μ. Numerous chlamydospores were formed, 10·5 to 19 by 9 to 10·5 μ (average 13 by 10 μ) in diameter. In culture the oval pore orifices varied from 0·19 to 0·39 by 0·14 to 0·28 mm. in diameter and the oval basidiospores measured 4 to 7·5 by 3 to 6 μ (average 4·4 by 4 μ). Single-basidiospore cultures were found to be heterothallic, sex being apparently determined by two factors. The optimum temperature for growth was about 26° C., with a maximum at 33°; growth was very slow below 10°. The optimum hydrogen-ion concentration was PH 6. The enzymes present were diastase, emulsin, invertase, zymase, pectinase, catalase, oxidase, peroxidase, and lipase.

In tests on blocks of ash, the fungus caused an initial temporary high loss in weight of the sapwood (apparently correlated with the presence of starch in the wood), but not of heartwood or intermediate wood. After four months the interior of the block was extensively rotted and crumbly, with a typical 'brash' fracture. The fungus was able also to attack beech, oak, Sitka spruce [*Picea sitchensis*], and Scots pine [*Pinus sylvestris*], generally softening the wood, which sometimes showed a tendency to divide into fibres. Special tests showed that the fungus is only moderately resistant to zinc chloride, sodium fluoride, and coal-tar creosote, and could be fairly readily controlled by their use.

SUMSTINE (D. R.). **Oriental Plane tree disease.**—*Science*, N.S., lxxxiv, 2176, p. 247, 1936.

Platanus orientalis in various localities of Pennsylvania is liable to infection by a mildew forming a white, floccose layer over part or whole of the leaf surface. The fungus was described in *Mycologia*, v, p. 58, 1913, and is identified by J. A. Stevenson as *Oidium obductum* Ell. & Langl. originally recorded on oak from Louisiana and on *Platanus* from West Virginia. Salmon (*Ann. mycol., Berl.*, iii, p. 493, 1905) regards *O. obductum* as a variety (*angulata*) of *Phyllactinia corylea* [*R.A.M.*, xiii, p. 128]. Further studies are necessary to determine the exact systematic position of the mildew.

GOIDÀNICH (G.). **'La moria dell'Olmo' (Graphium ulmi).** [Elm die-back (*Graphium ulmi*).]—136 pp., 44 figs., Rome, Ramo Editoriale degli Agricoltori, 1936. Price L. 10.

In this book the author concisely summarizes in semi-popular terms the information at present available on Dutch elm disease, caused by *Ophiostoma* [*Ceratostomella*] *ulmi* [*R.A.M.*, xv, p. 692]. The work is divided into four main sections dealing with (1) the species of elm grown in Italy, (2) the geographical distribution of the disease, its symptoms, transmission, and reproduction by inoculation, (3) the morphological, cultural, physiological, and biological characters of the

fungus, and (4) control by the use of resistant varieties. A bibliography of 93 titles is appended.

Swingle (R. U.). **A preliminary note on sexuality in Ceratostomella ulmi.**—*Phytopathology*, xxvi, 9, pp. 925–927, 1936.

Some 2,000 monoconidial isolates from mass isolates of *Ceratostomella ulmi* [see preceding abstract] from the Dutch Elm Disease Laboratory, Morristown, New Jersey, were tested for perithecial formation by growing them singly and in combination on sterilized elm twigs. Monoconidial isolates did not form perithecia, whereas crosses of some from different mass isolates did so. Mono-ascospore isolates repeatedly produced the *Graphium* stage in culture. An American elm [*Ulmus americana*], inoculated with a suspension from a mono-ascospore isolate, developed typical Dutch elm disease symptoms in a fortnight, and the *Graphium* stage of the fungus was recovered from the tree. Mono-ascospore isolates formed no perithecia, which were produced, however, by certain crosses in 9 to 42 days. Both monoconidial and mono-ascospore isolates frequently produced strikingly aberrant variants or sectors, in 75 of which from one mono-ascospore isolate the sexual characteristic of the parent culture either remained unchanged or the capacity for perithecial formation, but not for conidial production, was lost.

Tehon (L. R.) & Jacobs (H. L.). **A Verticillium root disease of American Elm.**—*Bull. Davey Tree Expert Co.* 6, 32 pp., 2 pl., 13 figs., 1936.

American elms (*Ulmus americana*) in the Ohio Valley are affected by a disease involving dwarfing, flaccidity, wilting, and chlorosis of the leaves, an abnormal production of abscission layers, striation and discoloration of the cambium, and death of the smaller roots, the cortex of which is readily detachable.

Of the 172 isolations secured from diseased roots, 43 per cent. belonged to a new species of *Verticillium* [*R.A.M.*, xiv, p. 203], *V. rhizophagum*, 11·7 to *Fusarium* (?) *solani* var. *martii* [ibid., xv, p. 339], and 6·9 each to *Sphaeropsis* and *Sclerotium*; the first-named was the only one obtained with sufficient consistency to suggest a pathogenic relationship, the existence of which was established by inoculation and reisolation experiments on seedlings and two-year-old trees. *V. rhizophagum* grew well on potato dextrose and malt agar at 23° C.; it is characterized by terminal, hyaline, spherical chlamydospores, 7·5 to 11·5 μ (average 10 μ) in diameter, occurring singly or in chains of two or three; variable conidiophores ranging from short, simple, hyphal branches, 2 to 7 by 1 to 1·5 μ, to verticillate structures, the verticils consisting of 1 to 7, commonly 4 branches, 12 to 20 μ in length; and oval to somewhat lunate conidia 2·5 to 5·5 by 1·5 to 3·6 μ.

The results of anatomical and histological studies indicate that the disturbance is essentially a parasitization and destruction of the cambium and most recently formed xylem and phloem, the death of the first-named certainly, and of other tissues possibly, taking place in advance of the fungus. The wood rays tend to grow for some time after the death of the cambium, but they finally succumb and, in the phloem region, undergo disorganization; by their agency the organism

is radially distributed through the root tissues, while elsewhere it passes laterally from cell to cell through simple and bordered pits. Tyloses develop in profusion within the invaded region, accompanied by the deposition of gum, tannin, and other protective substances, in the same or earlier rings, while minor changes in the xylem include separation of the tertiary thickening of the walls of wood cells, abundant accumulations of starch grains, development of callosities, and formation of mycelial pockets.

The Destructive Insect and Pest Act (Canada) and regulations thereunder.—*Acts, Orders & Regulations* No. 8 (3rd revised edition), 36 pp., 1936.

This revised edition gives details of plant disease legislation and regulations now in force in Canada [*R.A.M.*, iii, p. 239]. Reference may be made to Regulation 22 (Foreign) effective as from 10th June, 1936, which prohibits the importation of lily bulbs from Japan and her dependencies unless certified disease-free and as originating in fields free from virus diseases at the second inspection.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Notice of lifting of Quarantine No. 7 (foreign) White-Pine blister rust.—1 p., 1936.

The revocation, effective as from 1st September, 1936, of Quarantine No. 7, white pine blister rust [*Cronartium ribicola*] and its amendments Nos. 1 and 2, promulgated in 1913, 1916, and 1917, respectively, automatically places the entry into the United States of white pines, currants, and gooseberries under the provisions of Notice of Quarantine No. 37 [*R.A.M.*, xv, p. 752], the terms of which will permit the importation of these plant species in accordance with the restrictions of the Domestic White Pine Blister Rust Quarantine No. 63 [ibid., xiv, p. 544].

Bermuda Byelaws made by the Bermuda Board of Agriculture on 28th April, 1936, under the provisions of The Boards Act, 1929. Control of plant diseases and pests.—3 pp., 1936.

These Byelaws prohibit (apart from a specific insect quarantine) the importation into Bermuda of all parts of *Musa* spp., except the fruit, all parts of *Citrus* spp., except the fruit, from the West Indies and Bahamas, *Ipomoea* plants and tubers, Irish potatoes from Great Britain, Ireland, Europe, Newfoundland, St. Pierre, and Miquelon, raw or untreated carrots, all parts except the loose grain of maize, broom corn [*Sorghum bicolor* var. *technicus*], and other sorghums, and all parts except the flower and seed of *Lilium* spp. Special permits are required for the importation of banana fruits if wrapped, covered, or packed, of all parts of *Narcissus* spp., except the flower, and of all soil and plants growing therein.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*NachrBl. dtsch. PflSchDienst*, viii, 4, pp. 103–107; 5, pp. 128–130; 6, pp. 140, 142–147, 155–158, 1936.

Germany (Oldenburg and Lübeck). Orders dated, respectively, 9th May and 29th June, 1936, define the regulations governing the

activity of co-operative seed-grain disinfection establishments [*R.A.M.*, xvi, p. 24] in Oldenburg and Lübeck [cf. ibid., xi, p. 707]. Similar regulations were issued on 20th August, 1936, in respect of Mecklenburg.

ARGENTINA. By regulations dated 3rd June, 1936, the importation into the Argentine Republic of plants and parts thereof is permitted only if accompanied by properly authenticated health certificates. All material is subject to inspection at the port of entry, and if infested by a parasite not known to be present in Argentina must either be disinfected, or, if this is impracticable, returned to the place of origin within ten days, or burnt. Consignments of potatoes for seed or consumption must further be accompanied by a guarantee that the site of cultivation and a surrounding 500 m. zone are free from *Synchytrium endobioticum* and *Spongospora subterranea*. Seed potatoes showing more than 5 per cent. (by weight) infection by *Actinomyces scabies*, *Rhizoctonia* [*Corticium*] *solani*, *Spondylocladium atrovirens* [ibid., xiv, p. 223], or physiological disorders, as well as those with any proportion of virus diseases [ibid., xv, p. 823] or invaded by any pathogen not present in the country, will be refused admission. In the case of potatoes for consumption an incidence of up to 10 per cent. (by weight) of tubers infected by *A. scabies*, *C. solani*, and *S. atrovirens* is permissible. The entry of European vines is limited to those intended for use as scions on American stocks.

PERU. Under the terms of regulations published in *Sanid. veg. Min. Agric. Peru*, pp. 13–25, May, 1936, seeds and plants may be imported (subject to the usual safeguards) from foreign countries only by way of Callao and Iquitos and the post office of the latter place and Lima: the conveyance of seeds, plants, fresh fruit, and fresh vegetables by air [cf. ibid., xiv, p. 736] and in the diplomatic bag is prohibited.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 10, pp. 225, 227, 1936.

FEDERATED MALAY STATES. Under Notification No. 3659 of 23rd August, 1935, all plants and parts thereof belonging to certain genera and species (*Hevea*, *Gossypium*, *Coffea*, with the exception of dry berries, sugar-cane, *Camellia sativa*, &c.), shoots of all banana varieties (*Musa sapientum*), *Elaeis* fruits, coco-nut fruits, and all living parts of pineapple (except fruits from the Dutch East Indies), intended for importation into Malaya must be accompanied by official certificates of freedom from diseases and will be subject to inspection and, if necessary, to appropriate treatment before entry [cf. *R.A.M.*, vi, p. 448]. Permission to import must be obtained beforehand and importation should take place through the port of Swettenham or by post through the Agricultural Adviser or Chief Field Officer.

MOROCCO. A Decree of 1st August, 1936, defines the sanitary measures applicable to potatoes, tomatoes, and eggplants imported into the French zone of the Sherifian Empire with a view to the exclusion of *Synchytrium endobioticum*.

DOMINICAN REPUBLIC. A Regulation of 24th May, 1935, prescribes the procedure to be followed for the importation of plants, seeds, bulbs, and the like into the Dominican Republic. Imports are liable to inspection, and, if necessary, are placed in quarantine or destroyed.

IMPERIAL MYCOLOGICAL INSTITUTE

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HUET (M.). **La maladie du rond (Polyporus annosus).** [The ring disease (*Polyporus annosus*).]—*Bull. Soc. for. Belg.*, xlviii, 9, pp. 349–371, 1 fig., 1936.

The author discusses an outbreak of ring disease (*Polyporus* [*Fomes*] *annosus*) [*R.A.M.*, x, p. 355; xv, p. 473] on Scots pine [*Pinus sylvestris*], Corsican pine [*P. laricis*], and fir [*Picea excelsa*] in the Héverlé forest, Belgium, where the deciduous trees intermixed remained unaffected.

Initial infection appears to be largely due to the roots being injured by burrowing rodents (especially rabbits) and then infected by spores carried in the fur of the animals. Later spread occurs by contact between healthy and diseased roots. The results of infection vary in intensity according to the site of penetration in the root. If infection occurs on a large root near the collar, the symptoms may become apparent in a few months. In many instances the tree declines for some years and then dies unexpectedly.

In the locality concerned 20- to 30-year-old trees are chiefly affected. The disease has probably existed indefinitely, but has spread with increased rapidity during the past few years. In the worst areas, 100 trees per hect. have to be removed every year, but as the trunk wood is not affected, diseased trees cut down for sale while living suffer no diminution in commercial value. Trees on dry, elevated sites are practically unaffected, the disease becoming progressively worse with decreasing elevation and increasing soil humidity. Infection is most severe where the best soil conditions prevail, and vigour does not retard spread. The worst areas are those previously used for agriculture and treated with chemical fertilizers.

Prevention appears to be impracticable either by trenching or liming. Affected trees should be replaced by deciduous trees, and when pines are to be replanted the soil should be left untouched for 4 or 5 years. Damp sites should be drained, and rodents exterminated.

LAGERBERG (T.). **Några synpunkter på beståndsvård och virkesvård.** [Some aspects of care of standing timber and of wood.]—*Svenska SkogsvFören. Tidskr.*, xxxiv, 2, pp. 396–406, 1936. [English summary on pp. 472–473.]

Spruces in southern Sweden are stated to be liable to severe damage

by *Polyporus* [*Fomes*] *annosus* [see preceding abstract], an essential condition of infection by which is the existence of dead roots [*R.A.M.*, xii, p. 738]; when these portions are in direct communication with the heart of the trunk the fungus rapidly spreads through the latter, the increment of decay reaching up to 1 ft. per annum. The local infection of superficial roots usually occurs through wounds, such as may be inflicted by the carting of felled trees or by the trampling and grazing of cattle, the last-named factor being largely responsible for the attacks of *F. annosus* on aspen [*Populus tremula*]. The mycelium of the fungus is present in the humus layer of the forest and is the chief source of infection of the roots.

Stereum sanguinolentum [ibid., xvi, p. 77] is a common agent of decay following thinning operations and blazing or marking of the trunks.

Forest research in India, 1935–36. Part I. The Forest Research Institute.—91 pp., 1 fig., 1936.

The following items, other than those already noticed, occur in the mycological section of this report (pp. 24–26), dealing with investigations carried out by K. D. Bagchee, A. Hafiz Khan, and R. N. Chatterjee. Species of *Fusarium* have been found to play an important part in the etiology of the shisham [*Dalbergia sissoo*] root disease.

Red-currant (*Ribes rubrum*) leaves were successfully inoculated with cultures of *Peridermium indicum* [*R.A.M.*, viii, p. 77] from Kashmir, the uredo and *Cronartium* stages being reproduced on *Ribes*; *Pinus excelsa* plants inoculated with the *Cronartium* stage from red currant in 1934 are showing symptoms of infection. *Campanula colorata* leaves reacted positively to inoculation with *Peridermium orientale* (*P. complanatum*) [loc. cit.] from *Pinus longifolia* needles by development of the uredo and *Coleosporium* phases. *Peridermium brevius* [loc. cit.] on *Pinus excelsa* needles was found to be genetically connected with a new species of *Coleosporium* on *Senecio rufinervis*. *Peridermium piceae* developed on *Picea morinda* [loc. cit.] needles inoculated with *Chrysomyxa himalensis* from *Rhododendron arboreum*. A new species of *Peridermium* on *Abies pindrow* was successfully transferred to a fern (Polypodiaceae) on which the uredo and teleuto stages were produced.

Positive results were obtained in inoculation tests on *Cedrus deodora* and *Pinus excelsa* with *Fomes annosus* [see preceding abstracts].

Details are given in the wood preservation section (pp. 44–51) of the progress made during the year 1935–6 in the exploitation of the new preparation, ascu [ibid., xiv, p. 337], which was used by the North-western Railway for the treatment of 10,000 softwood sleepers. The total cost of the operations (including a supplementary anti-splitting treatment with a bituminous suspension of petroleum asphalt and crude oil, depreciation, handling, and labour charges) amounted to 7 annas 4 pies [about 8*d.*] per sleeper, whereas the cost of the present creosote–crude oil (40 : 60, 5 lb. per cu. ft.) is just over 1 rupee [1*s.* 6*d.*]. Six Ascu pressure plants came into operation during the year, and at least ten others are expected to start work shortly in various parts of the country.

WHITE (W. L.). **A new species of Chondropodium on Pseudotsuga taxifolia.**—*Mycologia*, xxviii, 5, pp. 433–438, 7 figs., 1936.

A description [with a Latin diagnosis] is given of an apparently hitherto undescribed fungus, commonly found occurring in Oregon and British Columbia on small (1 to 2 by 1 to 1·5 cm.), superficial, slightly sunken, and often somewhat orbicular lesions in the outer cortex of smooth-barked *Pseudotsuga taxifolia* trees, for which the name *Chondropodium pseudotsugae* n.sp. is suggested. It is characterized by erumpent, stalked, columnar, black, minutely scabrous pycnidia, 1 to 1·5 mm. in height, cylindrical above and 125 to 200 μ in thickness, and spreading at the base, which is more or less covered by the thin outer cortical layer of the host, to a diameter of 500 μ; occasionally two or three pycnidia may be found clustered on a common basal stroma. The conidia are hyaline, 4-celled, more or less straight at the basal part when attached to the conidiophores but crescent-shaped or falcate when lying free, and measure 35 to 60 by 3·5 to 4·5 μ. The disease associated with the fungus is stated not to be of a serious nature.

GARBOWSKI (L.). **Przyczynek do znajomości mikroflory grzybnej nasion drzew lesnych.** [Contribution to the knowledge of the fungal microflora of forest tree seeds.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 5–30, 6 pl., 1936. [French summary.]

The mycological analysis of Polish samples of forest tree seeds with germinability below normal revealed the presence of a diversified fungal flora on their surface. *Pyronema omphalodes* was isolated from *Pinus sylvestris* seeds, the predominant tree species in Poland, and was shown experimentally to reduce germination to at least 46 per cent. and occasionally to 5 or even 1 per cent., the average of 13 samples being 20 per cent. An undetermined species of *Botrytis* lowered the germination of the same species to an average of 34 per cent. Other species isolated from *P. sylvestris* seed were: *Chaetomium globosum*, *C. spirale*, *C. tortuosum* n.sp., *Mucor* sp., *Rhizopus arrhizus*, *Oedocephalum glomerulosum*, *Aspergillus flavus*, *A. niger*, *Penicillium crustaceum*, *Trichothecium roseum*, *Stachybotrys lobulata*, *Stysanus medius*, and undetermined species of *Penicillium* and *Fusarium*.

ROHDE (T.). **Adelopus-Schütte der Douglasie in Deutschland?** [*Adelopus* needle cast of Douglas Fir in Germany?]—*Forstarchiv*, xii, 18, pp. 305–310, 4 figs., 1936.

The *Adelopus* needle cast of Douglas firs [*Pseudotsuga taxifolia*] reported as occurring in Germany in 1930 [*R.A.M.*, x, p. 634], was actually first detected in Württemberg by Frl. E. v. Gaisberg in 1935. The fungus identified as *Adelopus* [*balsamicola*] on needles previously attacked by *Rhabdocline pseudotsugae* [ibid., xv, p. 832] was not an *Adelopus* but a *Rhizosphaera* [cf. ibid., xi, p. 136], and though only a secondary invader of the needles, is probably responsible for a considerable part of the damage hitherto attributed to *Rhabdocline pseudotsugae*.

BIRCH (T. T. C.). **Diplodia pinea in New Zealand.**—*Bull. N.Z. For. Serv.* 8, 32 pp., 16 figs., 1936.

In this study, an introduction to which is contributed by A. D. McGavock, the author states that *Diplodia pinea* [*R.A.M.*, xvi, p. 75] is commonly present on dead branches, cones, and felled timber in pine plantations throughout New Zealand, and has also been recorded from Italy, France, Belgium, United States, Argentine, South Africa, and Australia, either as a saprophyte on forest débris or as a weak parasite on pines growing under adverse conditions.

In New Zealand collections of the fungus the pycnidia are borne either singly or in densely bunched, compound groups, and with or without stromata, according to the stage of development and medium of growth. There would thus appear to be no justification for a transference of the organism either to *Botryodiplodia* as *B. pinea* (Desm.) Pet. or *Macrophoma* as *M. pinea* (Desm.) Pet. & Syd., and its inclusion in *Sphaeropsis* as *S. ellisii* [loc. cit.], is also untenable since this genus should comprise only unicellular spore types and those of *D. pinea*, though predominantly non-septate, are often uni- and occasionally biseptate. The name of *D. pinea* (Desm.) Kickx is therefore retained, a list of the synonyms and an English diagnosis being given.

The spores of the fungus are disseminated by means of wind, rain, and insects, while the mycelium is introduced into nurseries on the seed of several species of *Pinus*, including *P. ponderosa* of American origin. In this form *D. pinea* evidently occurs as a saprophyte on the surface of seed coats and in the interior of dead seed. A dark discoloration of *P. radiata* sapwood was found to be due to *D. pinea*, the hyphae of which were concentrated exclusively in the medullary ray parenchyma. No growth was made by the fungus in wood with a moisture content below 22 per cent., based on oven-dry weight.

Although normally a saprophyte, *D. pinea* sometimes assumes a parasitic form on unthrifty trees, on which the symptoms may take the shape of secondary infection on 'stag-headed' trees, 'red top', stem infection, or 'bud wilt' of seedlings. Three-year-old specimens of *P. ponderosa* in the field gave negative results on inoculation with the fungus, whereas trees of the same age and variety, planted in shallow boxes under abnormally humid conditions, showed typical 'red top' symptoms. Only a small proportion of *P. ponderosa* seedlings inoculated with *D. pinea* developed 'bud wilt' under unfavourable conditions of cultivation. The fungus is of economic significance in New Zealand as an agent of sap stain in felled timber, but its importance as a rare facultative parasite on sickly nursery and plantation stock is limited to indicating the existence of adverse silvicultural factors.

HUBERT (E. E.). **Permatol: a preservative treatment for exterior millwork.**—*Tech. Bull. West. Pine Ass.* 6, 7 pp., 1 fig., 1936.

The increasing demand during the past few years in the United States for sash, door, and millwork products treated with a chemical preservative has led to the development of three new preservatives, permatol A, B, and C, by the Research Laboratory of the Western Pine Association, Portland, Oregon.

The A formula consists of pentachlorphenol 5 lb., pine oil 1 gall., spreader (either eocene, Standard Oil Co. of California, or any of five others) $1\frac{1}{4}$ galls., and penetrant (either Thinner No. 1, Union Oil Co., or any of five others) $10\frac{3}{4}$ galls.; the B of pentachlorphenol $2\frac{1}{2}$ lb., tetrachlorphenol (or orthohydroxydiphenyl) $2\frac{1}{2}$ lb., and ingredients 2, 3, and 4 of the A formula; while the C formula for use against termites consists of tetrachlorphenol 5 lb., and ingredients 2, 3, and 4 of formula A. The new products are stated to have high toxic values and to possess a high degree of permanence besides other desirable features.

There are two methods of application. The first is to dip the unheated wood (finished or semi-finished) in the unheated solution for 10 seconds to 30 minutes. The second is to dip the unheated wood in the preservative at 100° or 110° F. for 10 seconds to 30 minutes. The completely assembled sashes or doors should be dipped in the product, singly or in bundles.

VAN SCHREVEN (D. A.). **Beschouwingen over het hartrot van de Biet en resultaten van potproeven in 1935.** [Observations on heart rot of the Beet and results of pot experiments in 1935.]—*Meded. Inst. Suikerbiet., Bergen-o-Z., 1936*, 6, pp. 153–225, 1 fig., 1936. [French summary.]

Following a summary of the literature published of recent years in various countries on the etiology and control of heart rot of beets [*R.A.M.*, xvi, p. 81], the writer fully describes and tabulates the outcome of pot tests in 1935 with Hilleshög beets in water, soil, and glass sand. In the water cultures the maximum development of the plants during a six-week growing period was made in the presence of 0·7 mg. boric acid per l. Beets can tolerate much higher concentrations of boric acid than most agricultural crops [loc. cit.], but the addition of 100 or even 50 mg. of the compound to water cultures induced various anomalies in the foliar habit. In soil cultures (heart rot soil from Switzerland) 50 mg. boric acid per l. effectually prevented the development of the disease. In the glass sand series the effects of an acid fertilizer were compared with those of two inducing an alkaline reaction, two applications of boric acid (each at concentrations up to 100 mg.) being given. In the alkaline series symptoms of heart rot appeared shortly after the second treatment given on 2nd August (all concentrations up to 15 mg.), whereas in acidified soil with comparable boron concentrations this was not the case. The development of the disorder so soon after the second application is thought to denote that the plants require much more boron during the later stages of rapid growth than at the commencement of the vegetative period. It was further shown by these tests that heart rot may affect beets in acid soils with an insufficiency of boron, while those in alkaline soils receiving adequate supplies of this element may escape.

EDGERTON (C. W.) & TIMS (E. C.). **Diseases of Sugar Beets in Louisiana.** —*Bull. La agric. Exp. Sta.* 273, 12 pp., 5 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 4, p. 502, 1936.]

An attempt was made to grow sugar beets on a commercial scale in Louisiana in 1926 and 1927, but production was seriously limited

by the *Rhizoctonia* [*R.A.M.*, xv, p. 486] and *Sclerotium* [? *rolfsii*: ibid., xv, p. 518] rots, the former causing losses up to 50 per cent. of the crop. Both diseases were favoured by moisture, but the former was most severe in cold weather and the latter in warm conditions. Heavy losses may occur in storage as well as in the field. Leaf spot (*Cercospora beticola*) [ibid., xv, p. 550 *et passim*] is liable to cause heavy damage in warm weather, while *Phoma betae* is of minor importance locally.

Asthana (R. P.). **Antagonism in fungi as a measure of control in 'red-leg' disease of Lettuce.**—*Proc. Indian Acad. Sci.*, iv, 3, pp. 201–207, 1936.

Of the fungi tested at the Imperial College of Science and Technology, London, for their repressive effect on the germination, growth in culture, and parasitic vigour (on cut leaves in Petri dishes) of *Botrytis cinerea*, the agent of 'red leg' of lettuce [*R.A.M.*, xv, p. 196], the most active were *Penicillium chrysogenum* [ibid., xiii, pp. 97, 304], *Eidamia* (*Trichoderma*) *viridescens* [ibid., iv, p. 227], *T. lignorum* [ibid., xv, p. 395], and *Phoma* sp., especially the two last-named. A similar effect was produced by filtrates of the nutrient medium (3 per cent. malt agar) in which the fungi had grown, indicating that staling products are involved in the inhibitory process.

Le Cosquino de Bussy (Ivonne J.). **De bacterieziekte van de Boon (Phaseolus vulgaris L.), veroorzaakt door Pseudomonas medicaginis f. sp. phaseolicola Burk.** [The bacterial disease of the Bean (*Phaseolus vulgaris* L.) caused by *Pseudomonas medicaginis* f. sp. *phaseolicola* Burk.]—Thesis, Univ. of Utrecht, 99 pp., 5 pl., 6 figs., 1936. [English summary.]

Pseudomonas [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xvi, p. 85] (which the writer prefers to term 'f. sp. *phaseolicola*' in accordance with current phytopathological usage) is stated to have been responsible since 1923 for severe losses to beans (*Phaseolus vulgaris*) in North Holland [ibid., xi, p. 96], where the disease is known as streak.

A few minor variations were observed between the bacterium isolated from diseased Dutch material and that described by Burkholder [ibid., xi, p. 418], e.g., in the number of cilia, one to three of which were detected by the writer compared with one only by Burkholder, and in the alkaline reaction developed in glucose and saccharose fermentation; these are, however, too slight to warrant any change in the nomenclature of the organism.

Positive results were given by inoculation experiments on two bean varieties, Improved Early Veen and Yellow Citron, by four methods, viz., on seedlings in pots, on seed afterwards sown (*a*) in open ground and (*b*) in tubes, and on soil in pots. In the seedling tests the former variety reacted more intensely to inoculation with strain VI than with strain V of the organism, while in the case of the latter these relations were reversed. In the tests on seed in open ground Yellow Citron suffered most severely, the attacks on Improved Veen and Fine Cluster Princess (included in this series) being milder. Both the first-named varieties were equally affected by the bacterium in the tests with seed

in tubes, the virulence of the symptoms reaching a maximum on a potato agar medium inoculated eight days before sowing, and being at a minimum on Knop's agar inoculated and sown simultaneously. In the soil series infection was most severe when the seed was planted immediately after inoculation.

The seed, which is largely responsible for the dissemination of *Bact. medicaginis* f. sp. *phaseolicola,* contracts infection through the suture of the pod; only the seed coats are involved, but the organism generally penetrates through several layers of the integument and is not confined to the intercellular spaces.

Control measures should include the use of seed derived from healthy plants and subjected to disinfection by ten minutes' immersion in water heated to 50° C., the cultivation of relatively resistant varieties [ibid., xv, p. 697], the removal and destruction of diseased material, spraying with Bordeaux mixture [ibid., xv, p. 419], and crop rotation.

AYYAR (V. R.) & IYER (R. B.). **A preliminary note on the mode of inheritance of reaction to wilt in Cicer arietinum.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 438–443, 1 pl., 1936.

From 1931 to 1936, two strains of gram (*Cicer arietinum*) consistently showed marked differences in their reaction to the wilt attributed by Narasimhan to a *Fusarium* [*R.A.M.*, ix, p. 10 ; xv, p. 423], strain no. 19 showing from 36 to 48 per cent. mortality and strain no. 468 from 0·4 to 7 per cent. When the strains were crossed the mortality distribution in the progeny indicated that incomplete dominance was involved. Progenies of three families each from the higher and lower mortality classes were studied in F_4, and all three of the latter proved homozygous for resistance, while in the former group two were homozygous for high mortality, and the third was intermediate in distribution. The high proportion of homozygous cultures suggests that wilt reaction is governed by only one pair of factors. Sections of the root of the resistant strain 468 showed a thick layer of suberin in the periphery of the cortex, whereas in the susceptible type suberin formation was not marked. The development of the fungus within the host was also very much slower in the resistant than in the susceptible strain. It is concluded that the resistance of strain 468 results from the combined effect of morphological and protoplasmic factors.

SHAW (F. J. F.). **The inheritance of morphological characters and of wilt resistance in Rahar (Cajanus indicus Spreng.).**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 491–492, 1936.

This account of the author's studies on the inheritance of wilt (*Fusarium vasinfectum*) resistance in pigeon pea (*Cajanus indicus*) [*C. cajan*] is an abbreviated version of a paper already noticed from another source [*R.A.M.*, xv, p. 771].

BRANAS (J.). **Chronique méridionale hebdomadaire. La maladie des yeux.** [Weekly notes from the south. Disease of the buds.]—*Rev. Vitic., Paris*, lxxxv, 2206, pp. 278–281, 1936.

The author explains the frequent failure of the measures recommended for the control of vine excoriosis (*Phoma flaccida*) [*R.A.M.*,

xv, p. 555] by the fact that the mycelium of the causal fungus over-winters in the dormant buds [ibid., xiv, p. 346], thus escaping the action of the chemicals applied. In many cases the mycelium is present not only in the basal buds but also in those placed higher up, thus stultifying the recommendation to remove the former and to preserve the latter. A way out of the difficulty might be to cut the diseased vine stocks down to the ground, so as to promote the formation of suckers, from which a new stock may be developed, provided that all suckers so produced are found to be free from infection. The term 'maladie des yeux' [bud disease] is further suggested as better adapted than excoriosis for characterizing the disease.

TROTTER (A.). **Biologia della Peronospora della Vite e lotta antiperonosporica.** [The biology of Vine mildew and its control.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno (Portici)*, v, pp. 65–79, 1 col. pl., 7 figs., 2 graphs, 1936.

After pointing out the need for a spray warning service against vine mildew [*Plasmopara viticola*] in southern Italy the author discusses the different stages of infection by *P. viticola* in relation to phenological factors, the importance of which is emphasized. It is thought that 4 to 6 spray applications should suffice in place of up to 12 now sometimes given. In addition to spraying, it is recommended that leaves bearing oospores should be collected and burnt.

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1935.** [Annual report for 1935 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Annu. agric. Suisse*, xxxvii, 10, pp. 1029–1077, 7 figs., 1 graph, 1936.

The following are among the phytopathological items occurring in this report [cf. *R.A.M.*, xv, p. 135]. The development of downy mildew of the vine [*Plasmopara viticola*] in 1935 was hampered by a cold, dry spell in May and by excessive heat in June and July; applications of Bordeaux mixture, cupromaag [ibid., xv, p. 588], viricuivre, and cupritox gave satisfactory control. Successful inoculation experiments on sound grapes with material of the agent of coître [*Coniothyrium diplodiella*: ibid., xvi, p. 23] dating from 1920, 1925, and 1928 effectively demonstrated the viability of the fungus during a period of 16 years. *Botrytis* [*cinerea*] caused a serious reduction of the grape yield in 1935.

Constantly increasing damage is inflicted, not only on raspberries, but on loganberries [*Rubus loganobaccus*] by *Didymella applanata* [ibid., xi, p. 694], which injures the wood and kills the buds.

BERTUS (L. S.). **Report on the work of the Mycological Division.**—*Adm. Rep. Dir. Agric., Ceylon, 1935*, pp. D53–D60, 1936.

In 1935 an interesting case of tea leaf disease (*Corticium solani*) [*R.A.M.*, viii, p. 470; xiii, p. 216] occurred in Ceylon on four or five 4- to 5-year-old bushes. The leaves were firmly attached to each other by wefts of mycelium; the stems were healthy, and loose mycelium was found on the surface. The fungus probably developed in the soil, ascended the stems, and attacked the leaves.

Sclerotium rolfsii [ibid., xiii, p. 540] was recorded for the first time

on citrus in Ceylon, causing a collar rot of young, imported, grafted orange plants. It was suspected that the fungus had spread from decaying vegetable matter used in the holes or as a mulch.

During a long dry period the bark of the trunk and large branches of grapefruit trees developed a thin longitudinal crack which gradually exposed the wood and sometimes exuded gum. The wound usually healed over in time, but in some cases a species of *Diplodia* penetrated the wood, and killed back the branch. The wounds are attributed to sun scorch following defoliation. Shaving back the affected tissues to the sound wood, painting with a 20 per cent. solution of brunolinum or carbolineum, and tarring gave effective control.

The result of further work on citrus canker (*Pseudomonas citri*) [ibid., xv, p. 136], the worst disease of grapefruit and lime in Ceylon, showed that satisfactory control was given on grapefruit by judicious pruning, the collection and destruction of affected leaves, fruits, and green twigs, and spraying at each new burst of foliage (15 times in all) with 30 oz. colloidal sulphur, $7\frac{1}{2}$ oz. nicotine sulphate, and 30 oz. soft soap in 30 galls. water. Control on severely affected limes has proved difficult, and such trees should be uprooted and destroyed.

Larvae of *Oryctes rhinoceros* were found to have been naturally killed by the green muscardine fungus *Metarrhizium anisopliae* [ibid., xv, p. 137]. Traps infected with the fungus were prepared as in the previous year on an estate situated at an elevation of about 500 ft. above sea-level. All the larvae found in the traps were killed by the fungus, though those in the uninoculated control traps were unaffected. It was necessary to keep the traps fairly moist.

Mildew (*Oidium* sp.) on cowpea vines [*Vigna unguiculata*] was completely controlled by two applications at an interval of six days of 1 oz. colloidal sulphur per gall. of water.

In inoculation experiments on tea roots with pure cultures of *Ustulina zonata* isolated from beech and lime (*Tilia* sp.) in England [ibid., xv, p. 471], and tea and rubber in Ceylon, the tea strain caused the most extensive infection, which involved the roots, collar, and the stem up to a height of about 9 in. The rubber strain infected the tissues for only a distance of 0·7 in., and the lime and beech strains produced practically no infection.

Jak [*Artocarpus integrifolia*] developed a new disease characterized by small, soft, purplish-brown patches on the surface of the fruit from which a species of *Diplodia* was isolated. Inoculations with this fungus on wounded, fully grown fruits caused visible infection in three days and the appearance of the purplish patches a day later. When fully grown fruits attached to the plant were inoculated, infection resulted after ten days. The fungus tended to set up premature ripening, the apparently ripe portions remaining hard.

New records included brown root disease (*Fomes noxius*) of tung oil (*Aleurites montana*), leaf disease (*Cercospora cruenta*) of *Dolichos lablab*, cotton leaf disease (*C. gossypina* and *Macrosporium* sp.), leaf spot (*Macrosporium* sp.) of granadilla (*Passiflora quadrangularis*) [cf. ibid., xv, p. 593], collar disease (*S. rolfsii*) of young mahogany (*Swietenia mahagoni*), and downy mildew (*Pseudoperonospora cubensis*) of snake gourd (*Trichosanthes anguina*).

NARASIMHAN (M. J.). **Report of work done in the Mycological Section for the year 1934–1935.**—*Adm. Rep. agric. Dep. Mysore, 1934–1935*, pp. 19–22, 1936.

The first external symptom of a widespread disease of Ras Bale plantains due to *Sclerotium rolfsii* [cf. *R.A.M.*, xiii, p. 540] in Mysore and Tumkur is a splitting of the pseudo-stem near ground-level and a reddish discoloration of the sheaths. Infection progresses inwards through successive layers of leaf sheaths and finally involves the pseudo-stem. Over 2,000 plants have been satisfactorily treated by removing affected sheaths and applying Bordeaux paste to the base or swabbing the pseudo-stem with 0·5 per cent. Bordeaux mixture.

A small plot of rice showing infection by *Piricularia* [*oryzae*: ibid., xvi, p. 122] was dusted with flowers of sulphur, which largely controlled the fungus.

The so-called 'katte' disease of cardamons [*Elettaria cardamomum*], which seriously attacked nearly 60 per cent. of nursery seedlings in the Saklespur area, originates in the form of minute, white spots on the leaves, surrounded by a water-soaked halo and bearing a few pycnidia of a *Coniothyrium*. At a later stage the entire leaf surface becomes spotted and eventually the apical leaves curl up and decay. The same host is liable to extensive infection by a *Corticium*.

The teleutospore stage of the coffee leaf disease [*Hemileia vastatrix*: ibid., xv, p. 798] was found to be prevalent in Bangalore, except during the period of heavy rains from June to September.

Apple plants inoculated with a pure culture of *Schizophyllum* [*commune*: ibid., xiii, p. 641; xvi, p. 106] from diseased trees failed to develop infection, indicating that other fungi may be responsible for wood rot though obscured by the rapidly growing *S. commune*.

Very good control of orange mildew [*Oidium tingitaninum*: ibid., xv, p. 136] was obtained in the Saklespur area with gingelly oil Bordeaux.

SU (M. T.). **Report of the Mycologist, Burma, Mandalay, for the year ending the 31st March 1936.**—5 pp., 1936.

The following are among the items of interest in this report [cf. *R.A.M.*, xv, p. 280]. A species of *Helminthosporium* closely resembling *H. oryzae* [*Ophiobolus miyabeanus*] was observed on *Panicum colonum* grass surrounding rice plots infected by the brown spot disease [ibid., xv, p. 632].

Chilli (*Capsicum annuum*) mosaic [ibid., xiv, pp. 78, 344] occurred in a fairly severe form in the northern part of Yamèthin District.

None of the isolations made before storage from 400 mangosteen (*Garcinia mangostana*) stalks yielded *Diplodia* [*natalensis*] [loc. cit.], which probably gains ingress, therefore, through some other channel.

The incidence of storage rots in Mandalay oranges due to *Penicillium digitatum*, *P. italicum*, *D. natalensis* [ibid., xv, pp. 715, 716, 797], and *Phoma* sp. amounted to 56, 7, 7, and 28 per cent., respectively.

The cultivation of the edible straw mushroom (*Volvaria diplasia*) [ibid., xiv, p. 286] was hampered by the development of a disease in the beds due to *Corticium* sp., which in some cases entirely precluded production.

Simmonds (J. H.). **The work of the Plant Pathological Branch.**—Reprinted from *Rep. Dep. Agric. Qd, 1935–1936*, 3 pp., 1936.

This report contains, *inter alia*, the following items of phytopathological interest. Good commercial control of barley covered smut [*Ustilago hordei*: *R.A.M.*, xiv, p. 572] was given by the mercurial dusts sanogran A, ceresan U.T. 1875, and Cooper's mercurial; formalin (1 in 320) was less effective, and sulphur was useless. The same mercurial dusts and the formalin treatment gave good control of prairie grass [*Bromus unioloides*] smut [*U. bromivora*: loc. cit.].

Seed treatment with ceresan reduced the amount of seed-borne infection by cotton angular leaf spot [*Bacterium malvacearum*: see below, p. 171] to negligible proportions.

Further investigations into banana black end, chiefly due to *Gloeosporium musarum* [ibid., xv, p. 281], indicated that latent infection may occur. The presence of dead leaves round the pseudo-stem appeared to conduce to the disease, while frequent trashing reduced its incidence. Field studies demonstrated that severe fruit infection may arise in the absence of many free spores in the plantation or packing-shed, rain, apparently, being the chief agent of spread. The main source of spore inoculum is the pustules on dead petioles.

Appreciable losses have recently been caused by a banana trouble known locally as 'rubbery fruit', in which the skin ripens to an almost brownish-yellow and often shows conspicuous water-soaked lines running longitudinally. The flesh is abnormally firm and rubbery, the fruit bending considerably under pressure without breaking. The condition is tentatively attributed to physiological disturbances associated with plantation conditions interfering with ripening.

Sclerotinia sclerotiorum and *Monilochaetes infuscans* [ibid., xiv, p. 87] were recorded from beans and sweet potatoes, respectively. Papaw yellow crinkle [ibid., xiv, p. 216] was of considerable economic importance in the Yarwim district.

In addition to *Boletus granulatus* [ibid., xii, p. 778], *Rhizopogon luteolus* was found to form mycorrhiza on several species of *Pinus*. Acidifying the soil with 4,200 lb. sulphur per acre led to rapid mycorrhiza infection in exotic pines in the district concerned, the treatment enabling pine seedlings to be grown locally, though previously it had been necessary to obtain them from coastal nurseries.

The organism responsible for root rot of hoop pine [*Araucaria cunninghamii*: ibid., xv, p. 281] was identified at the Imperial Mycological Institute as a strain of the *Rhizoctonia crocorum* group [*Helicobasidium* sp.]. It appeared to be controlled by means of Cheshunt mixture.

A butt rot of maple [*Acer*], *Flindersia brayleyana*, kauri pine [*Agathis australis*], hoop pine, and *Cupressus lusitanica*, which caused appreciable loss, was associated with a fungus provisionally identified as *Hymenochaete mougeotii*.

Martyn (E. B.). **Report on the Botanical and Mycological Division for the year 1935.**—*Div. Rep. Dep. Agric. Brit. Guiana, 1935*, pp. 89–92, 1936.

The following are among the items of interest in this report [cf. *R.A.M.*, xv, p. 202]. Blue Stick rice raised from seed procured from

the seed-farm of the Department of Agriculture, Henrietta, Essequibo, was attacked by *Sclerotium oryzae* [*Leptosphaeria salvinii*: ibid., xvi, p. 123] in three localities of the Northern Essequibo Islands; no other variety was affected, nor was infection reported from the seed station itself. Previous outbreaks of *S. oryzae* in the Colony caused only negligible damage. As in 1932, *Acrothecium lunatum* [*Curvularia lunata*: ibid., xv, p. 740] was found to be associated with a brown discoloration of the paleae of flowering heads of rice, especially Demerara Creole [ibid., xiii, p. 357] and No. 79, during the wet season. Inoculation experiments with the fungus in a damp atmosphere gave positive results.

Sporadic outbreaks of banana leaf spot (*Cercospora musae*) [ibid., xv, p. 705] were observed on the Gros Michel variety on the east and west banks of the Demerara and on the east bank of the Berbice River. The same variety was mildly infected by *Helminthosporium torulosum* [ibid., xv, p. 451] on the east bank of the Berbice River.

Cacao in a small area in the North-West District was attacked by *Corticium salmonicolor* [ibid., xiv, p. 87 *et passim*].

Forty-eighth Annual Report of the Arkansas Agricultural Experiment Station for the fiscal year ending June 30, 1936.—*Bull. Ark. agric. Exp. Sta.* 337, 73 pp., 4 figs., 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 221]. Of the 29 cotton varieties and strains tested at the Cotton Branch Station during the period under review by V. H. Young and L. M. Humphrey, Half and Half was the most susceptible to wilt (*Fusarium vasinfectum*) [ibid., xv, p. 149], with 50 per cent. infection, followed by Acala 120–25 (33), while a fair degree of resistance was shown by Dixie 14–5 and 14–1, Lightning Express 8, Dixie Triumph 25, Rhyne's Cook and Clevewilt, and Rowden 4046 and 5056. Half and Half was also the most susceptible variety at Ozark in western Arkansas, where Super Cleveland was severely attacked. Both wilt and 'rust' or potash hunger [loc. cit.] have been observed in the course of eight years' experiments to be more severe in plots manured with phosphate, either alone or in combination with sodium nitrate, than in untreated ones, while the application of kainit leads to a striking reduction in the disease incidence, the following percentages of wilt being counted: controls 16·48, 6–8–12 fertilizer (600 lb.) 4·25, 6–8–0 24, phosphate alone 36, and kainit 1·64. Stable manure, while inferior to a mixed fertilizer or to muriate of potash or kainit alone in combating wilt, is nevertheless valuable for this purpose.

Short-grain, early maturing varieties of rice were found by E. M. Cralley to be generally more resistant to stem rot [*Helminthosporium sigmoideum* var. *irregulare*: ibid., xv, p. 314] than those with medium or long grains, and attempts are in progress to develop these characters by hybridization. An investigation of irrigation practices in relation to the virulence of stem rot showed that the withdrawal of standing water from the fields for certain periods prior to the maturity of the crop retards the development of the disease but does not normally increase the yields. The viability of the sclerotia of the fungus in the soil was found to persist for fully two years, so that short-period rota-

tion schemes are not likely to be effective against stem rot, the rapid advance of which was found to be promoted by a uniform water temperature of 75° to 85° F. in August and September.

In H. R. Rosen's studies the fireblight pathogen, *Erwinia amylovora* [*Bacillus amylovorus*] and the agent of pear blast (*Phytomonas* [*Pseudomonas*] *syringae*) [ibid., xv, p. 23] have sometimes been found in abundance in pear and apple blossoms that have failed to set. Pear nectar has been shown to form an excellent medium for the growth of *B. amylovorus* [ibid., xiv, p. 370], strands of which have been traced as far as eight cell layers below or to the sides of the sub-nectarthodal chambers within 48 hours from inoculation. The invasion of the tissues involves not only passage through the intercellular spaces [ibid., vii, p. 142; viii, p. 250] but localized dissolution of the middle lamellae and delicate cell-walls. Apple blossoms are frequently penetrated through the stigmas, the process being apparently favoured by the absence of a cuticle on the papillae and the presence between the latter of numerous air spaces. Within 52 hours after inoculation through these channels, bacterial strands have been traced through the entire length of the style and into the upper part of the receptacle. When the bacteria gain ingress through the anther locules they invade the filaments by way of the connective and ultimately reach the receptacle.

One of the worst epidemics of black spot of roses [*Diplocarpon rosae*: ibid., xv, p. 781] on record occurred in the State in 1935; the best control (though not altogether adequate) was given in H. R. Rosen's experiments by a dusting mixture of sulphur, lead arsenate, and colloidal clay. The McGredy, Ami Quinard, and Lady Alice Stanley varieties are resistant.

Report of the Michigan Agricultural Experiment Station for the two years ended June 30, 1936.—61 pp., 1936.

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, xiv, p. 219]. The total amounts of carbohydrates in the leaves of healthy and mosaic red raspberries [see below, p. 194] are about equal, but the proportions are different, the diseased foliage containing about half as much glucose and three times as much sucrose as the healthy and considerably less starch, which occurs mostly in the form of amylopectin in the former and in that of amylodextrin in the latter.

Both wild and cultivated plums have been found to harbour certain viruses affecting peaches [viz., yellows and little peach] without sustaining any apparent damage [ibid., xiv, p. 682], thereby serving as reservoirs of infection which is transmissible to the alternate host in a virulent form.

Satisfactory commercial control of apple scab [*Venturia inaequalis*], even in epidemic form, may be obtained by thorough and timely applications of 'electric' and flotation sulphur [ibid., xv, p. 727] at the rate of 6 lb. per 100 galls. of spray, but for average conditions the use of the standard lime-sulphur for the pre-blossom applications is probably safer.

From 90 to 95 per cent. resistance to wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*: ibid., xvi, p. 132] has been shown by the newly released

Michigan State Forcing tomato, the F 7 progeny of a cross between Ailsa Craig and Marglobe. This variety constituted some 60 per cent. of the 1936 commercial forcing crop in the Grand Rapids area.

A new strain of Michigan Golden has been found to equal any of the commercial strains of yellow celery, which it far outyields, moreover, when planted on soil infested by *Fusarium* yellows [ibid., xiv, p. 737].

Laboratory studies have revealed striking differences in the texture of the sclerotial tissues of *Rhizoctonia* [*Corticium*] *solani*, which are believed to account for the variable results obtained in the fungicidal treatment of black scurf [ibid., xv, p. 602 *et passim*]; acidulated mercuric chloride is the best of the compounds hitherto tested against this disease.

Semesan jr. [ibid., xiii, p. 503] gave good control of seedling blight of field maize [*Gibberella saubinetii*] in 1936, while wheat bunt [*Tilletia foetens*] was effectively combated by copper carbonate, new improved ceresan [ibid., xv, pp. 10, 346, and below, p. 162], and monohydrated copper sulphate.

Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1935.—*Bull. Mo. agric. Exp. Sta.* 370, 100 pp., 1 fig., 1936.

Numerous items of phytopathological interest are included in the sections of this report dealing with botany, horticulture, and field crops [cf. *R.A.M.*, xv, p. 281]. C. M. Tucker estimates that the oat crop was reduced by 20 to 25 per cent. as a result of smut [*Ustilago avenae* and *U. kolleri*] infection during the period under review, the corresponding figures for loose (*U. nigra* [see below, p. 167] and *U. nuda*) and covered [*U. hordei*] smuts of barley being 5 and 20 per cent., respectively. *U. nuda* in the Spartan and Glabron spring varieties was more effectively combated by lengthy immersion in water at 45° to 48° C. than by shorter periods (an hour or less) at 50° to 55°, the addition to the water of traces of [American] ceresan largely preventing the injury to germination liable to accompany this method of control, especially in Glabron, though not otherwise increasing the efficacy of the treatment. In the case of the winter variety, Tennessee No. 5, however, ceresan and formaldehyde, as well as protracted immersion in hot water, gave good control, a fact interpreted as pointing to the implication of *U. nigra* rather than *U. nuda* in the causation of loose smut in the winter stands, this being the first record of the former in the State.

C. M. Tucker, C. G. Schmitt, and G. W. Bohn noted the following varietal reactions (in decreasing order of resistance) to *Fusarium* [*bulbigenum* var.] *lycopersici* among tomato varieties [see preceding abstract]: Marglobe, Break o' Day, Pritchard, Globe, Stone, Norton, and Earliana. Tubes of agar inoculated with the fungus and placed just below the soil at a temperature of 27·5° to 58° showed no growth after a certain length of time, but resumed development when incubated; those buried at depths of 4, 8, and 12 in. (29° to 30°) showed progressively more luxuriant growth.

Among the species of *Phytophthora* received by C. M. Tucker during the year were *P. parastica nicotianae* from tobacco in Poland, *P. parasitica* from *Antirrhinum majus*, *Dianthus caryophyllus*, and papaw

in Mauritius, and from *Robinia pseud-acacia* in Virginia, *P. capsici* from *Cucurbita pepo* and *Capsicum annuum* in Virginia, *P. cinnamomi* from *Pinus resinosa*, *P. sylvestris*, and *Quercus rubra* in Maryland and from *Picea abies* in Virginia [ibid., xvi, p. 72], and *P. megasperma* [ibid., xv, p. 188] from *Matthiola incana* and *Brassica* spp. in California.

A white bacterium, somewhat resembling *Bacterium* [*Pseudomonas*] *cerasi* [ibid., xiv, p. 16] var. *prunicola*, was isolated by C. M. Tucker from leaf spots and cankers on cherries and inoculated into the Schmidt's Big, Bing, and Black Tartarian varieties and also into peaches with positive results. The Yellow Glass cherry variety appears to be resistant. The lesions induced by the organism are circular, with a light brown centre and a narrow reddish halo, and the cankers are formed near the tip of the green stems.

The incubation of [tobacco mosaic] virus fractions with trypsin [ibid., xi, p. 334] by C. G. Vinson led to a marked decrease of infectivity, which was largely restored by 20 minutes' heating at 70°. Papain (alone, but not in combination with trypsin) inactivated the virus to such an extent that heating at 70° failed to restore its original virulence. Gradual inactivation (incomplete after 5½ months) was also brought about by mixed cultures of micro-organisms.

A method has been devised for reducing the ash content of virus preparations to 2 per cent. of the total solids, compared with 30 and 10 to 20 per cent. for the acetone and safranin-virus precipitates, respectively [ibid., xv, p. 687].

The best yellows- [*F. conglutinans*: ibid., xv, p. 3] resistant cabbage varieties for Missouri are Marion Market, Jersey Queen, Globe, and a new (Wisconsin) strain of Copenhagen, all of which in H. G. Swartwout's and R. A. Schroeder's tests showed 98 to 100 per cent. resistance on a heavily infested soil inducing 67 to 89 per cent. susceptibility in the standard types.

The National Agricultural Research Bureau of the Ministry of Industry National Government of the Republic of China. Report for the year 1935.—*Misc. Publ. nat. agric. Res. Bur. Minist. Ind., China*, 5, 68 pp., 1 fig., 1936.

The following items of phytopathological interest occur on pp. 34–36 of this report. Loose and covered smut of barley (*Ustilago nuda* and *U. hordei*), covered smut of oats (*U. levis*) [*U. kolleri*], and loose and flag smuts of wheat (*U. tritici* and *Urocystis tritici*) are stated to be coextensive with the cultivation of the respective crops in China, whereas the loose smuts of oats and rye (*Ustilago avenae* and *U. tritici* [*R.A.M.*, iv, p. 445; v, p. 226]) are comparatively rare. Both types of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] proved amenable to control by two minutes' immersion of the seed-grain in water heated to 52° C. [ibid., xiv, p. 745]. The simplest and cheapest method of combating the wheat smuts is by two to four hours' immersion at 45° to 48°, which reduces infection 99 per cent. and increases the yield by some 30 per cent. *U. crameri*, the agent of the destructive kernel smut of millet [*Setaria italica*: ibid., xiv, p. 691], was well controlled by four to six minutes' immersion of the seed-grain in water at 58°, resulting in an increased yield of some 39 per cent., while formalin, ceresan, and

alcohol were also effective for this purpose, augmenting the output by over 32 per cent.

Sclerotinia sclerotiorum [ibid., xv, p. 781; xvi, p. 13] has been isolated from 15 vegetable and other hosts. No morphological or physiological differences could be detected between this species and the forms parasitizing Chinese vetch (*Astragalus sinicus*) and groundnuts, which are usually known, respectively, as *S. trifoliorum* [ibid., xv, p. 725] and *S. miyabeana* [ibid., xiii, p. 616]. The host range of *S. minor* [ibid., xv, p. 24] appears to be less extensive than that of *S. sclerotiorum*, comprising in these studies only groundnut, *A. sinicus*, broad beans [*Vicia faba*], and the weed *Erigeron acris*. An undetermined species of *Sclerotinia* was found parasitizing broad beans only.

VAN DER GOOT (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1935.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1935.]—*Meded. Inst. PlZiekt., Batavia*, 87, vii+106 pp., 1936.

This report, prepared on the usual lines [cf. *R.A.M.*, xv, p. 345] contains, among many others, the following records of interest. *Xylaria thwaitesii* [ibid., xiv, p. 743] was found on the dead roots of young teak [*Tectona grandis*] in Java plantations, where the same host also suffered from a basal rot due to *Fomes noxius* [ibid., xv, p. 345] and severe infection by slime disease [*Bacterium solanacearum*: ibid., xiv, p. 153].)

F. noxius appears to be the cause of heavy damage to cacao plantings on the north coast of Java [ibid., xii, p. 425].

According to a report from the Central and East Java Experiment Station, *Crotalaria* is attacked by *Parodiella spegazzinii* [ibid., vii, p. 679].

Hevea rubber in West Java was extensively infected by *Septobasidium rubiginosum* [ibid., x, p. 557]. In the central and eastern districts *Polyporus* [*F.*] *lignosus* is the most important root fungus of rubber [ibid., xv, p. 136]. Mildew (*Oidium heveae*) was relatively innocuous during the period under review. A rubber planting in the Besoeki district was visited by an epidemic of *Helicobasidium compactum* [ibid., xiv, p. 426].

Heavy losses in Java *Cinchona* plantations were caused by *Rosellinia arcuata*, *Armillaria mellea* [ibid., x, p. 298], and other root fungi, while *Moniliopsis aderholdi* was present in the seed-beds [ibid., vii, p. 308].

Five coffee plantations under the supervision of the Central and East Java Experiment Station are now infected by the *Rhizoctonia* causing top die-back, while a species of the same genus was responsible for damping-off on two [ibid., xv, p. 345]. The former disease was observed during 1935 for the first time in the Besoeki district.

Oil palms in Java were attacked by *F. noxius* [ibid., xv., p. 78] and red rust (*Cephaleuros* sp.).

Extensive damage was inflicted on the Java sugar-cane crop by pokkah-boeng, attributed to *Fusarium moniliforme* [*Gibberella moniliformis*: ibid., xv, p. 346] and other *F.* spp., up to 30 per cent. infection by which was reported from East Cheribon. By means of stringent selection of planting material and disinfection of knives the incidence of gumming disease (*Bact. albilineans*) [ibid., xvi, p. 126], which was very prevalent in 1935, may be considerably reduced.

A marked increase in the *Vanilla* [*planifolia*] disease due to *Phytophthora* [cf. ibid., ix, p. 767; xiii, pp. 58, 618] was reported from the Semarang district of Java as a result of intensive cultivation.

BERTHELOT (A.) & AMOUREUX (GERMAINE). **Sur les tumeurs obtenues par inoculation de Bacterium tumefaciens à des plantules et des jeunes plantes cultivées aseptiquement.** [On the tumours obtained by the inoculation of *Bacterium tumefaciens* into seedlings and young plants cultivated aseptically.]—*C.R. Acad. Sci., Paris*, cciii, 14, pp. 629–631, 1936.

Seedlings of pea, vegetable marrow, and Large Russian one-flowered sunflowers (*Helianthus uniflorus*) [*Helianthella uniflora* Torr. & Gray] were raised in glass tubes on synthetic agar under strictly aseptic conditions and inoculated with *Bacterium tumefaciens* [cf. *R.A.M.*, xv, p. 206] by means of a fine glass needle either immediately after germination or at a height of 5 to 10 cm. The conditions of the tests were peculiarly favourable to the organism, which developed on the inoculated plants with much greater luxuriance than in the case of older plants in pots or in the ground, the formation of neoplasms frequently commencing as early as a week after inoculation. The advantages and potentialities of this experimental technique are briefly indicated.

HASKELL (R. J.). **The present status of seed treatment discussed at American Seed Trade Association Convention.**—*Agric. News Lett.*, iv, 10, pp. 135–139, 1936. [Mimeographed.]

A stimulus was given to the large-scale treatment of seed-grain by the great drought of 1934, when the Government of the United States bought several million bushels of wheat, oats, and barley for seed purposes. The value of the practice was further emphasized by the black rust [*Puccinia graminis*] epidemic of 1935 [*R.A.M.*, xvi, p. 25], which was shown primarily to affect crops raised from mouldy seed of poor quality and low vitality. At the Minnesota and Washington, D.C., Agricultural Experiment Stations the average increases in the emergence of seed-grain treated with organic mercury dust were 14, and 12 and 9 per cent. (two tests), respectively; similar figures were obtained in North Dakota and Canada. Centralized or community seed-treatment is stated to be gaining ground [ibid., xvi, p. 144]. Portable cereal seed-treating outfits, mounted on trucks and usually combined with cleaning equipment, originated in the West, and several large seed companies in the East have now also adopted co-operative methods, a Virginia firm, for instance, having disinfected some 100,000 bushels of wheat, oats, and barley in 1935.

LEUKEL (R. W.). **The present status of seed treatment, with special reference to cereals.**—*Bot. Rev.*, ii, 10, pp. 498–527, 1936.

After pointing out that losses due to bacterial and fungal diseases of commercial crops in the United States amount to about $1,000,000,000 annually, the author reviews the development of seed disinfection treatment and associated problems as they apply to conditions in the United States under the following headings: historical, advantages of dust fungicides, problems in developing and testing seed treatments, cereal

diseases combated by seed treatment, fungicidal materials, organic mercurials, control of diseases of vegetables, ornamentals, and other crops, centralized seed treatment [see preceding abstract], and effects of seed treatment. A bibliography of 139 titles is appended.

Porter (R. H.) & Layton (D. V.). **Small grain diseases in Iowa and their control.**—*Ext. Circ. Ia St. Coll.* 226, 23 pp., 19 figs., 1936.

Short, popular notes are given on the symptoms and control by seed treatment of seed-borne diseases of barley, oats, wheat, and rye. On the basis of extended tests over a period of three years the authors recommend the use of new improved ceresan against a number of these diseases [see above, p. 158]. Several makes of large seed-treatment machines are now available for use in grain elevators.

Brenner. **Saatreinigung und Aufbereitung.** [Seed-cleaning and preparation.]—*Tech. in d. Landw.*, xvii, 8, pp. 163–165, 1 fig., 4 diags., 1936.

Among the seed-treating machines on view at a recent exhibition at Frankfurt-am-Main was the short disinfection apparatus Primator (Drescher, Halle) to which the silver medal of the Reich Food Board has been awarded, and a new outfit for the same purpose constructed by Röber, Wutha (bronze medal). In this connexion some advantages of the short disinfection process [*R.A.M.*, viii, p. 768 *et passim*] over dusting are briefly indicated, viz., suitability of the former for oats and in general on very dry soils, and avoidance of the risk of inhalation of dust by operators.

Gassner (G.) & Goeze (G.). **Einige Versuche über die physiologische Leistungsfähigkeit rostinfizierter Getreideblätter.** [Some experiments on the physiological efficiency of rust-infected cereal leaves.] —*Phytopath. Z.*, ix, 4, pp. 371–386, 13 graphs, 1936.

The inoculation of wheat leaves with a physiologic form of *Puccinia glumarum* [*R.A.M.*, xv, p. 144] producing the 'immune' type of infection on a given variety exerted no influence on the assimilatory capacity, chlorophyll content, and transpiration volume of the foliage. On the other hand, the use of forms causing recognizable symptoms was followed, about a week after inoculation, by a definite decline both in resistant and susceptible varieties, in the chlorophyll content and assimilatory capacity of the leaves. In the case of a virulent type of infection the transpiration relations of the inoculated leaves differ widely from those of the controls; whereas in the latter the transpiration and assimilation curves run approximately parallel, in the former the transpiration values rise while those for assimilation fall sharply, doubtless on account of the combined transpiration of the leaf and of the fungus during the period of sporulation. Evidently, therefore, the disorganization of the water balance is one of the factors to be considered in the appraisal of yield reductions from cereal rusts.

Nozdratcheff (K. G.). Поваренная соль в борьбе с ржавчиной зерновых культур. [Common salt in the control of cereal rusts.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 28–31, 1936. [English summary.]

The author states that in hanging drop cultures the uredospores of

wheat brown rust [*Puccinia triticina*] failed entirely to germinate in a 5 per cent. sodium chloride solution, while the germination was reduced from 51·4 per cent. in the control to 1·3 per cent. in a 1 per cent. solution. Field tests in 1933 and 1935 showed that in plots that had been top dressed with salt (150 kg. per hect.) after the disappearance of the snow cover, the incidence of brown rust was reduced from 34·6 and 22·2 per cent. in the controls, to 10·1 and 10·5 per cent., respectively. Further researches on the use of salt in the control of cereal rusts are advocated.

Rashevskaya (Mme V. F.) & Barmenkoff (A. S.). Выявление физиологических рас **Puccinia triticina Erikss.** в Союзе в **1935** г. [Determination of the physiological races of *Puccinia triticina* Erikss. in the U.S.S.R. in 1935.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 5–20, 3 figs., 1936. [English summary.]

This is a somewhat expanded and fully tabulated version of the authors' report on the biological composition of wheat brown rust (*Puccinia triticina*) in the U.S.S.R., an account of which has already been noticed from another source [*R.A.M.*, xvi, p. 25]. Of the 13 physiologic forms recorded, forms 64 to 69, inclusive, are stated not to have been previously described in literature. Form 64 gave type 4 reaction on the Malakoff, Carina, Brevit, Webster, and Loros, and type *x* reaction on the Mediterranean, Hussar, and Democrat differential varieties; form 65 gave type 4 reaction on Malakoff, Webster, Loros, and Hussar, type 2 on Carina and Brevit, and 0–1 type on Mediterranean and Democrat; form 66 gave type 4 reaction on all the varieties; form 67 gave type 4 reaction on Malakoff, Webster, Loros, Hussar, and Democrat, type 2 on Carina and Brevit, and type 0 on Mediterranean; form 68 gave type 2–3 on all the varieties, except on Webster, on which the reaction was of type 1–2, and on Malakoff which was immune from it; and form 69 gave type 2–3 reaction on all of the varieties. [These new forms are distinct from forms 66 to 69 described by Florence M. Roberts [ibid., xv, p. 707], who states in a footnote that she used international numbers assigned by C. O. Johnston in January, 1935; and from forms with similar numbers described by Sibilia: ibid., xvi, p. 89.]

Goeschele (E. E.). Биологический состав бурой ржавчины **Puccinia triticina Erikss.** в Одесском районе. [The biological composition of the brown rust *Puccinia triticina* Erikss. in the Odessa region.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 21–27, 1936. [English summary.]

As a result of his researches since 1931, the author established the presence in the wheat-growing areas around Odessa of the physiologic forms 13, 20, 21, and 24 of brown wheat rust (*Puccinia triticina*) [see preceding abstract], and also of a fifth form close to form 31, but differing from it in its reaction on the differential variety Carina. An experimental study of form 13 showed that at temperatures lower than normal it reacted like form 14 on the Mediterranean and Democrat varieties. From a review of the relevant literature and from his own results the author considers that the present internationally agreed range of eight differential wheat varieties (which he terms 'analysers') should be somewhat extended and should also comprise wheats other than soft

ones. In his opinion, all the biotypes of *P. triticina* which react similarly on a determined set of analysers should be grouped together under the term 'iso-reagents', and then these groups may be analytically distributed into biological or physiological races with due regard to the ecological adaptation and geographical distribution of both rust biotypes and host varieties, and to the genetical constitution of the latter as determined by hybridization studies [*R.A.M.*, ix, p. 768].

FOMIN (E.). Использование сортовых свойств растений в борьбе с болезнями. [Utilization of the varietal characters of plants in disease control.]—*Bull. Ukrain. sci. Rec. Inst. Grain Culture, Phytopath. Lab., Kharkoff*, 1, pp. 88–133, 4 figs., 1935. [English summary. Received January, 1937.]

A tabulated account is given of investigations on the breeding of cereals against disease carried on since 1925 at different agricultural centres of the Ukraine. Among other things, it was experimentally shown that resistance in wheat to bunt (*Tilletia caries*) was very significantly affected by the depth at which the seed was sown, e.g., infection in soft wheats raised from artificially bunt-contaminated seed varied from 1·8 to 34·5 per cent. when sown 1 cm. deep, from 19·3 to 70 per cent. at 4 cm., and from 62 to 91·7 per cent. at 7 cm., the corresponding figures for hard wheats being 2·3 to 17·6, 4·7 to 53·6, and 22·8 to 86·9 per cent., respectively. Among the large number of spring wheat varieties tested very few exhibited practical resistance to bunt, the least attacked being found in the botanical varieties *milturum*, *lutescens*, and *albidum* of the soft, and in the varieties *hordeiforme* and *coerulescens* of the hard wheats. The relatively higher resistance of the hard wheats is in part attributed to the fact that in the germination process the plumule of the embryo in the great majority of cases develops for the first few days inside the seed coat, being thus protected from invasion by the fungus, and emerges in a more advanced, and therefore less susceptible, stage of growth than the plumule of the soft wheats, which appears very soon after germination. Winter wheats, as a class, are appreciably less susceptible to bunt than spring wheats, the least amount of infection having been observed in the *milturum* and *alborubrum* botanical varieties.

Soft wheats, both autumn- and spring-sown, were all shown to be susceptible to loose smut (*Ustilago tritici*) in artificial infection tests, and only a few varieties showed practical resistance in the field; hard wheats, on the other hand, are generally more resistant, and a considerable number of varieties were found showing practical resistance under natural conditions. Most of the oat varieties tried were highly susceptible to both covered and loose smuts (*Ustilago levis* [*U. kolleri*] and *U. avenae*), only a few exhibiting resistance, those belonging to the botanical variety *aurea* being the least attacked.

While soft spring wheats are, as a rule, severely attacked by brown leaf rust (*Puccinia triticina*), hard wheats are much more resistant, the reverse relationship obtaining for stem [black] rust (*P. graminis*); only one of the varieties of the former which were tested, namely, 0274 of the Odessa station, showed practical resistance to brown rust in some years, and another, namely, 062 of the same station, to black rust.

Among winter wheats, the variety 2537/64 Zaria [Dawn] was practically resistant to brown rust throughout the Ukraine, and the varieties 074, 62/24, 30–11, 22–6, and 13–040 also appeared to be resistant to this rust. Almost all the resistant varieties belong to the botanical variety *erythrospermum*, which therefore deserves special attention from the wheat breeders. Only one oat variety, Verkhniatcheski 053, showed high resistance to crown rust (*Puccinia coronifera*) [*P. lolii*]. Field observations showed that in 1933 all the winter and spring wheats were severely attacked by *Septoria tritici* [*R.A.M.*, xvi, p. 20], infection being 80 to 100 per cent. in the former and 30 to 70 per cent. in the latter. A relative degree of resistance was only shown by the winter wheat variety 2537/64 Zaria. The highest degree of resistance to *Helminthosporium gramineum* was exhibited by the barley varieties Wiener, 10/30, 041, 322, 23/11, 176/10, 307, 25/32, and Grushevski. Black point (*H.* sp.) [ibid., xiii, p. 759; xv, p. 433] in wet years is widely spread, especially among hard wheats. Black chaff (*Bacterium translucens* var. *undulosum*) [ibid., xvi, p. 91] is prevalent in dry seasons on winter wheats, especially in the botanical forms with red ears; the varieties *hostianum* and *velutinum* are apparently immune.

In terminating it is stated that in 1931 about 300 inbred lines were isolated from polymer crosses of four different wheat parents, one of which is resistant to bunt, the second to loose smut, the third to Hessian fly [*Mayetiola destructor*], and the fourth was characterized by good and sufficiently large grain; all the lines isolated were highly resistant to both smuts, some of them being even immune from bunt.

HOLTON (C. S.) & HEALD (F. D.). **Studies on the control and other aspects of bunt of Wheat.**—*Bull. Wash. St. agric. Exp. Sta.* 339, 35 pp., 2 figs., 1936.

In experiments on the control of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], seed treated with copper carbonate dust (50 per cent.) at the rate of 2 oz. per bush. and copper arsenite [*R.A.M.*, xv, p. 344], 2 and 4 oz. per bush., and sown in soil artificially contaminated with bunt, gave, respectively, 4·4, 4·6, and 5·1 per cent. infection in lightly contaminated soil, and 12·5, 11·1, and 8·7 per cent. in the more heavily contaminated soils, as compared with 13·2 and 22·2 per cent. infection, respectively, for the controls.

Basic copper sulphate dust [loc. cit.] used at the rate of 2 oz. per bush. reduced infection on the Federation variety carrying spore loads of 0·1, 0·4, and 1·5 gm. per 120 gm. seed, from 17·5, 39·9, and 44·4 per cent. to 0, 0·02, and 0·1 per cent., respectively, the corresponding figures for Marquis wheat being 3, 11·3, and 33·7 per cent., and 0, 0, and 0·1 per cent., respectively. The effectiveness of the treatment remained unimpaired after one year.

Holding seed treated with copper carbonate dust (20 and 50 per cent., 3 oz. per bush.) for three weeks to nine months before planting did not materially affect the efficiency of bunt control in spring plantings of Federation wheat, but the practice lessened the protective value of [American] ceresan (3 oz. per bush.). Periodic sowings of heavily contaminated Hybrid 128 dusted similarly before the first sowing showed decreasing effectiveness of the three treatments from early

September to late October sowings. On heavily infected Hybrid 128 seed new improved ceresan at ½ oz. gave as good control as ceresan at 2 oz. per bushel.

Copper carbonate dust did not give the same control with different physiologic races of the bunt organisms; poorer control was obtained with races of *T. caries* than with those of *T. foetens*.

Washing the grain [ibid., ix, p. 446; xv, p. 344] reduced infection from 19·1 to 2·9 per cent. on the average, and when used before dusting the seed should make it possible to utilize heavily infected grain with reasonable safety.

Trench seeding gave less infection than normal surface drill seeding in periodic plantings under natural field conditions, and in artificially contaminated soil reduced infection by at least 50 per cent. [see preceding abstract].

Marquis wheat seed, obtained from different regions and uniformly infected with *T. caries*, when planted at Pullman showed from 18·39 to 42·55 per cent. infection, variation in another similar test being greater with *T. caries* than *T. foetens*. Growing the wheat strains for one year at Pullman made them somewhat more uniformly susceptible, while Pullman seed grown for one year in other localities and returned to Pullman for sowing showed variations in the percentages of bunt ranging from 12·6 to 39·9 for *T. caries* and 12·9 to 38·6 for *T. foetens*.

Two new physiologic races of *T. caries* [ibid., xv, p. 287] were found, one of which attacked Ridit wheat rather severely and the other Hohenheimer. A third race of *T. caries* observed in Klickitat County, Washington, and similar to that described by Young [ibid., xiv, p. 350], is distinguished by spore size, prominent reticulations of the spore walls, hard spore balls, poor spore germination, failure to obtain infection by planting affected seed, and excessive tillering and dwarfing of the infected plants. The data obtained indicated that the growing of resistant varieties has led to the increase and spread of new races of *T. caries* and *T. foetens* which may have arisen by hybridization of species or races, or by mutation.

Varietal resistance may vary with the locality owing to the prevalence of different races of bunt. The use of composites of large numbers of races of bunt, however, is not a reliable method of determining absolute bunt varietal resistance since environmental factors may affect reaction, and tests in various localities are recommended. Indices of winter hardness are not obtainable from heavily bunted plantings, and plantings showing winter injury are not reliable for determining bunt resistance.

Vanderwalle (R.) & Larose (E.). **La désinfection à l'eau chaude des semences contre le charbon nu Ustilago tritici Schaf.** [Hot-water disinfection of seed against loose smut, *Ustilago tritici* Schaf.] —*Bull. Soc. Bot. Belg.*, lxix, 1, pp. 39–40, 1936.

This account of the writers' experiments in the control of loose smut of wheat (*Ustilago tritici*) has already been noticed from another source [*R.A.M.*, xv, p. 636].

TAPKE (V. F.). **Pathogenic strains in Ustilago nigra.**—*Phytopathology*, xxvi, 10, pp. 1033–1034, 1936.

In field tests on 17 varieties of barley with ten collections of *Ustilago nigra* [*R.A.M.*, xv, p. 791] in May, 1935, the susceptibility of the Himalaya (16·8 per cent. infection) and Nepal (32·0) varieties and the resistance of Lion (2·5) to collection 186 from Wisconsin served to differentiate this strain pathogenically from the rest. In the autumn of the same year, greenhouse experiments confirmed this result when collection 185 (Colorado) again failed to infect Himalaya and Nepal but produced 100 per cent. smutted heads in Lion, while 186 caused 68, 30, and 16·7 per cent. infection, respectively, in the three varieties.

[JONES (G. H.).] **Advice to farmers growing Wheat and Barley for seed.**—*Ahram*, 4th November, 1 p., 1936. [Arabic.]

For the control of flag smut [*Urocystis tritici*] of Hindi wheat (*Triticum vulgare*) raised for seed purposes in Egypt immersion of the seed sown in 2 per cent. solution of copper sulphate for 5 minutes or dusting with cuprous chloride [*R.A.M.*, xv, p. 208] at the rate of 0·5 kg. per ardeb [about 4 per 1,000 by weight] is recommended. Planting should be carried out by the afir method [by which the seed is broadcast on dry land, lightly harrowed, and then irrigated immediately]. Hindi seed wheat should be planted preferably in Upper Egypt, where flag smut is less prevalent and wherever possible on land not sown to Hindi wheat for several years. Beladi wheat (*T. durum*) is immune from the disease.

FRUTCHEY (C. W.). **A study of Stewart's disease of Sweet Corn caused by Phytomonas stewarti.**—*Tech. Bull. Mich. agric. Exp. Sta.* 152, 25 pp., 5 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 5, pp. 642–643, 1936.]

Following a review of the work of previous investigators on bacterial wilt of maize (*Phytomonas* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xvi, p. 113], the writer emphasizes the great economic importance of the disease and describes its symptoms in detail. He has never been able to isolate the causal organism from the soil or from the embryo of the seed, but obtained it repeatedly from the extra-embryonic portions of seed from infected plants; it was shown to be incapable of invading the uninjured embryo at the time of germination.

Definite proof is further adduced of the implication of the seed-corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) in the transmission of *A. stewarti* from the infected to the healthy part of the seed, the bacterium having been isolated both from the exterior and interior of larvae of the insect. The common wheat wireworm (*Agriotes mancus*) was also found to act as a mechanical carrier of bacterial wilt, but appears to be unable to harbour the organism for any length of time.

A *Fusarium* and a white bacterium, possibly related to *Phytomonas* [*Bacterium*] *dissolvens* [ibid., xii, p. 426], were sometimes found associated with *A. stewarti*, the former causing a virulent foot rot which quite eclipses the bacterial wilt, while the latter may serve to pave the way for

the entrance of *A. stewarti* by invading and rotting away the tissues of the vascular system.

The use of resistant maize varieties appears to be the sole means of combating bacterial wilt, surface sterilization of the infected seed having proved ineffectual, while internal disinfection without injury to the embryo was impracticable in the writer's experiments.

The author concludes that infected seed, insect transmission, and the organisms associated with *A. stewarti* are the main factors in the propagation of bacterial wilt. Although the bacterium can be isolated from seed produced by affected plants, little or no disease develops in the progeny from such seed in the absence of other factors, owing to the freedom of the embryo from the organism and the inability of the latter to migrate unaided from the chalazal region to the vascular tissue of the seedlings. Insects feeding on the roots and old kernels of the seedling may disseminate infection either by themselves carrying the organism or by contact in the case of diseased seed. Morphological and other data indicate that general infection of a maize plant with *A. stewarti* occurs at the base, where large numbers of vascular bundles are involved, whether the inoculum is contained in the seed or carried by insect larvae.

HARRIS (M. R.). **The relationship of Cephalosporium acremonium to the black-bundle disease of Corn.**—*Phytopathology*, xxvi, 10, pp. 965–980, 2 figs., 1936.

Black bundle disease of maize has been generally attributed to the invasion of the vascular bundles by *Cephalosporium acremonium* [*R.A.M.*, x, pp. 180; xii, p. 505; xv, p. 360], but in the present study on material consisting of inbred strains from California, Illinois, and Wisconsin, the condition was found to be primarily due to a deposit of a gum-like substance in the cells and vessels of the bundles, associated with the fungus in less than 4 per cent. of the total number (420) of samples examined. The gum was found on microchemical analysis to contain small quantities of pentoses, which serve as food for *C. acremonium*.

In one inbred strain the gum deposit in the vascular bundles was shown to be a concomitant of hereditary characters, besides being influenced by environmental conditions. In controlled experiments black bundles were produced in one strain by limiting the water supply and in another by providing the plants with a phosphorus-deficient nutrient solution. Certain strains reacted to the severe drought of 1930 by the development of black bundles in the field, while in one line the disorder resulted from cultivation in phosphorus-deficient soil.

Inoculation tests with *C. acremonium* on maize seedlings of the several strains under observation gave negative results, while the planting of diseased seed failed to result in the establishment of the fungus in the growing plant. The organism was found, however, in older plants derived from strains with gum-filled vascular bundles, infection having evidently occurred after the tasseling-out of the stalks and following severe root injury. In none of the experiments was *C. acremonium* found to be an active pathogen attacking normal vascular bundles through unwounded root systems.

HOPPE (P. E.) & HOLBERT (J. R.). **Methods used in the determination of relative amounts of ear rot in Dent Corn.**—*J. Amer. Soc. Agron.*, xxviii, 10, pp. 810–819, 5 graphs, 1936.

The purpose of this paper is to describe certain aspects of the technique used in connexion with the co-operative breeding of maize for resistance to ear rots [*Gibberella moniliformis*, *G. saubinetii*, *Diplodia zeae*, *Nigrospora* sp., and miscellaneous fungi] in Illinois [*R.A.M.*, xv, p. 793].

The first study involved methods of measuring infection in field samples. The percentage of rotted ears was determined by count in each of 37 hybrids and varieties from 50-hill populations. The percentage of rotted kernels in the shelled grain from the same samples was then ascertained, using 200- to 300-gm. samples for analysis. A comparison of the results from the two methods of determining ear rot in these identical samples showed the ear separation method to have given very inaccurate results, but a modification of this method, involving the determination of the percentage of rot by weight, proved more efficient. Harvestings delayed until December not only ran considerably higher in ear rot than those collected in October, but the differentials between resistant and susceptible strains were widened in the former.

A statistical analysis of variability showed that the determinations on the 200-gm. samples were as accurate in 95 per cent. of the cases as the results obtained from 400-gm. samples.

Scab disease of Lemons.—*Agric. Gaz. N.S.W.*, xlvii, 10, p. 568, 1936.

In the control of scab (*Sporotrichum citri*) [*Sphaceloma fawcettii scabiosa*: *R.A.M.*, xiv, p. 162; xv, p. 436] of lemon in New South Wales, growers are warned that the closest attention is required to the time of application of the Bordeaux oil (6–4–80–$\frac{1}{2}$) spray, viz., after half but before all the petals have fallen. Moreover, the spray must be applied thoroughly to be effective.

MCLENNAN (E[THEL] I.). **Notes on the organisms causing brown rot of Citrus fruit in Victoria, Australia (Phytophthora citrophthora (Sm. & Sm.) Leon. and P. hibernalis Carne).**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 96–103, 1 pl., 2 figs., 1936.

Isolations from lemons and oranges affected by brown rot in Victoria from 1931 to 1933 yielded *Phytophthora citrophthora* and *P. hibernalis* [*R.A.M.*, xv, p. 280], the former being constantly present in material collected in the autumn and the latter in the spring lots. Brown rot being more prevalent in the autumn under local conditions, *P. citrophthora* may be regarded as the chief agent of the disease in the State. Cultures of this fungus obtained from Queensland and the United States were compared with the Victorian isolations and showed the Australian to differ from the American strains in the consistency and topography of the cultures. Tucker has suggested [ibid., x, p. 754] that a more careful investigation of the *Phytophthora* spp. isolated from citrus in the tropics might lead to their transference from *P. citrophthora* to *P. palmivora*, but in the writer's experiments the former made

no growth at 32° C., and the latter developed profusely, whereas at 5° the situation was reversed. Moreover, no sexual organs developed as a result of mating the various Australian isolations with the rubber and cacao strains of *P. palmivora*, but they were formed freely in consequence of fusion between the latter. These differences are regarded as sufficient to exclude *P. palmivora* from implication in the Victorian form of brown rot.

HAAS (A. R. C.). **Phosphorus deficiency in Citrus.**—*Soil Sci.*, xlii, 2, pp. 93–116, 6 pl., 1936.

In this full account of an investigation conducted at the California Citrus Experiment Station on the deficiency phase of phosphorus nutrition in citrus by the use of soil, sand, and solution cultures it is stated that the symptoms produced on citrus leaves are variable, consisting in fading of the chlorophyll, burning of the leaf-blade, reduction in foliar dimensions, or the development of a dull, brownish-green tinge. The shape and contents of affected lemon leaf cells undergo certain changes: there is increased shoot growth, but this is almost exclusively terminal; in severe cases the leaves not only burn but are brittle to the touch and droop at the petiole in a direction parallel to the shoot axis and later absciss.

RISBEC (J.). **Les parasites du Caféier en Nouvelle-Calédonie.** [Coffee parasites in New Caledonia.]—*Agron. colon.*, xxv, 226, pp. 105–123, 1936.

Hemileia vastatrix is stated to be the most serious pathogen of coffee in New Caledonia, where it was first observed in 1911 at Ponérihouen, and rapidly spread throughout the island. The relatively resistant Robusta type was introduced as an emergency measure to replace the Arabica bushes destroyed by the disease, but by degrees all attempts to combat the fungus have been allowed to lapse. In this connexion attention is drawn to the comparative vigour of Arabica bushes with brown shoots, which suffer less severely from *H. vastatrix* than those with green ones.

Stilbum nanum [?*Marasmius pulcher*: *R.A.M.*, vi, p. 127] is also prevalent in the Colony, but causes much slighter damage than the foregoing. The Robusta types are chiefly affected. Good control may be effected by spraying with Bordeaux mixture. This fungus is liable to attack various other plants, including the shade tree *Acacia lebbek*. It forms black, circular spots on coffee leaves, which become detached but remain suspended along the branches by the slender, black hyphal cords of the organism.

MCDONALD (J.). **The susceptibility of Harar Coffee to disease.**—*Mon. Bull. Coffee Bd Kenya*, ii, 22, p. 191, 1936.

Seedlings of the promising Harar variety of Arabica coffee introduced into Kenya in 1931 have been found in tests at the Scott Agricultural Laboratories to show unsatisfactory disease-resistance qualities. It is abnormally susceptible to the economically unimportant *Cercospora*

coffeicola [*R.A.M.*, xiv, pp. 31, 397] and appears to be at least as susceptible to leaf disease (*Hemileia vastatrix*) [ibid., xv, p. 798] as the French Mission type. Eight five-year-old bushes in August, 1936, showed up to 50 per cent. infection by berry disease (*Colletotrichum coffeanum*) [*Glomerella cingulata*: ibid., xvi, p. 86], though infection was very slight on most.

VERDEREVSKI (D. D.), LEBEDEVA (Mme O. P.), VASSIN (P. F.), VYSKVORKO (G. G.), DJELALOFF (R.), & MOSKOVETZ (S. N.). Гоммоз Хлопчатника. Материалы к построению системы мероприятий. [Gummosis of Cotton. Materials for the elaboration of a system of control measures.]—*Закавказский н.-исслед. хлопк. Инст., научн. Сер.* [*Publ. Transcauc. sci. Res. Inst. Cotton, Sci. Ser., Tiflis*], 52, 168 pp., 17 figs., 1 map, 26 graphs, 8 diags., 1935. [English summaries. Received November, 1936.]

In this collection of papers a brief historical, biological, and morphological account is first given of the blackarm or gummosis disease (*Bacterium malvacearum*) of cotton, together with a summary of the results of investigations in 1933 and 1934 on the etiology and control of the disease in Transcaucasia and Armenia [*R.A.M.*, xvi, p. 35, and next abstracts]. Laboratory experiments showed that immersion of cotton seed for from 5 to 15 minutes in formalin (1 in 100), followed by covering for 2 hours, completely controlled surface infection of the seed, without unduly interfering with the germinability, while treatment of the seed with sulphuric acid did not entirely destroy the parasite. In field plots raised from formalin-treated seed infection was about half that present in control plots, while in plots raised from seed treated with sulphuric acid it was reduced only by some 30 per cent. In Azerbaijan cotton sown very early in the season (March to early April) or late in May showed a lesser degree of infection than normal sowings (second half of April to the beginning of May).

In the last paper, Lebedeva states that *Bact. malvacearum* was obtained in pure culture in both years from aseptically dissected pieces of cotton seeds (exclusively from badly infected bolls) that had been delinted for 30 minutes in sulphuric acid of 1·8 sp. g., after which they were immersed in a 0·1 per cent. mercuric chloride solution for 10 minutes and then washed four times in sterile tap water, thus demonstrating internal infection of the seeds by the organism [cf. ibid., xiii, p. 766]. The bacterium was never isolated, however, from seed collected from infected plants, unless the lint showed visible signs of infection. There was evidence that it was only present in the fleshy portions of the seed, and it is suggested that invasion takes place from the infected lint before the hardening of the seed-coat. Internal infection was found in practically all the seeds from infected bolls that were examined, but it is not believed to play an important part in the dissemination of the disease owing to the fact that badly diseased bolls are generally excluded at the harvest. There also was evidence that less than 50 per cent. of such seeds germinate after sowing, and isolations from the seeds that failed to grow up indicated that they mostly contained only the saprophytic yellow bacterium, which frequently accompanies *Bact. malvacearum*, and *Alternaria tenuis*.

BABAYAN (A. A.), KIRAKOSSYAN (A. V.), & BEZHANYAN (Z. S.). Материалы по изучению гоммоза Хлопчатника и по борьбе с ним в ЗСФСР. [Contribution to the knowledge of Cotton gummosis and to its control in Transcaucasia.]—*Закавказский н.-исслед. хлопк. Инст., научн. Сер.* [*Publ. Transcauc. sci. Res. Inst. Cotton, Sci. Ser., Tiflis*], 46, 96 pp., 1935. [English summary. Received November, 1936.]

A concise, tabulated account is given of the investigations carried out up to the end of 1933 in Armenia, and partly also in Azerbaijan, on the biology and control of the blackarm disease of cotton (*Bacterium malvacearum*) [see preceding and next abstracts]. It was shown, *inter alia*, that the causal organism in pure culture withstood constant freezing, with occasional falls of temperature as low as —27·8° C. for a whole month in 1933, but died out during the subsequent three or four weeks, when periods of freezing alternated with warmer spells, during which the thermometer showed temperatures up to 10·6°. In infected cotton leaves the bacterium survived two months when buried under snow, but was killed within a month when periods of thawing alternated with frosts. In one series of tests pieces of infected cotton plants were buried in soil in pots, and exposed to outdoor winter conditions, but no infection resulted when disinfected cotton seed was sown in the pots at the end of the spring. Furthermore, while living bacteria could be still found in cotton plant debris in the field at the beginning of March, 1933, all were found to be dead in the debris tested at the end of the same month. In another series of experiments it was shown that *Bact. malvacearum* on naturally infected cotton seed withstands a temperature of 90° C. for 5 hours in a dry, and for not less than 1 hour in a damp, atmosphere, while in pure culture it was killed within 20 minutes at 50° and within 10 minutes at 56°.

Delinting the cotton seed with sulphuric acid gave almost complete control of the disease in 1933, and secondary field infection of the seedlings raised from the treated seed was very limited. Seed disinfection of the seed with 1 in 100 formalin is also recommended because of its efficacy, cheapness, and ease of application. The incidence of the disease was markedly increased by poor tillage of the soil, belated thinning out of the cotton stands, and too late flooding. Egyptian and American Upland cotton varieties transplanted from hotbeds were significantly less susceptible to the disease than plants grown in the field. While all the cotton varieties tested were found to be susceptible, the highest degree of resistance was found in the King Karajaz variety among the Uplands, and in the Sakel 473 and 465, and Mela bessa 1474 varieties among the Egyptians.

SMITH (H. P.), JONES (D. J.), KILLOUGH (D. T.), & MCNAMARA (H. C.). **Chemical dust treatment of Cottonseed for planting purposes.**—*Bull. Tex. agric. Exp. Sta.* 531, 24 pp., 1936.

The results [which are fully tabulated and discussed] of experiments in progress since 1930 in various localities of Texas to determine the effect on cotton stands and yields of different methods of treating and delinting fuzzy (gin-run) seed showed an increase both in seedling

emergence (denoting control of *Colletotrichum* [*Glomerella*] *gossypii* [*R.A.M.*, xv, p. 149] and *Rhizoctonia* [*Corticium*] *solani* [loc. cit.]) and yield in the ceresan-treated (4 oz. per bush.) lots, the former ranging from 11 to 65 and the latter from 4 to 25 per cent. under optimum planting conditions. The emergence of mechanically delinted seed was also increased by treatment with ceresan which reduced the incidence of angular leaf spot [*Bacterium malvacearum*: ibid., xv, p. 214, and preceding and next abstracts] in plants raised from seed delinted with hydrochloric acid or sulphuric acid [ibid., xiv, p. 562].

In the tests at Lubbock in the High Plains region of the State the total number of cotton seedlings emerging generally increased with the lateness of the sowing date from 25th April to 25th May, while thinning the cotton to a 12-in. spacing augmented the yields of both treated and untreated fuzzy and delinted seed.

Neither Bayer dust 502 nor copper carbonate proved equal to ceresan for the purposes in view, but promising indications (requiring further confirmation) were given by treatment of the seed with commercial hydrated lime at the rate of 3 oz. per bush.

Massey (R. E.). **Section of Botany and Plant Pathology, A.R.S. Report by Mr. R. E. Massey on experimental work carried out by the staff of the section during season 1934–35.**—*Rep.* [*Gezira*] *agric. Res. Serv., 1935*, pp. 34–55, [1936. Mimeographed].

In 1934, cotton blackarm [*Bacterium malvacearum*: *R.A.M.*, xiv, p. 757; xv, pp. 426, 437, and preceding abstracts] appeared earlier in the Gezira area of the Sudan than during the previous season, but owing to the absence of heavy late rains, spread was slow and generally localized.

Flooding of the land after the clearance of the debris from the previous crop resulted in the germination of enormous numbers of seedlings from fallen seed-cotton, and as a number of these became infected with blackarm, a second clearance before sowing is clearly indispensable. In two large-scale experiments in Hag Abdullah and Suleimi, over 17 pairs of selected plots averaged 5·9 and 37·7 per cent. blackarm infection in the flooded and unflooded control areas, respectively. In 13 out of the 17 cases, over five times as many infected plants were found in the untreated as in the treated area. Laboratory experiments showed that when clean cotton seed sown in mixtures of fresh, infected debris and Gezira or Shambat soil, and flooded with river water for various periods, the debris lost most of its infective power after 2 to 4 days' flooding, and was innocuous after 5 days' flooding. When the soil was replaced by sand, the infective power lasted longer, and when sand and tap water were used infections were obtained even after 8 days' flooding.

Observations on plots scattered over the central part of the Gezira showed the presence of isolated plants heavily infected with blackarm to be a peculiar feature of the season, and due to infected debris blown over during the cleaning of old cotton land. The concentration of infection on the side of the plots nearest the old cotton land was much less marked than hitherto. Flooding land occupied by cotton the previous season largely eliminated infection from this source, and considerably reduced volunteer seedlings. Spectacular evidence was obtained of the rapid spread of infection throughout the plot from small,

isolated centres. It was found impossible to exclude blackarm completely from isolated plots in any area in the Gezira during the rainy season, but considerable control results from sowing in such plots.

Seed disinfection tests with standard abavit B and a home-made dust of similar composition showed both to be about equally effective against blackarm. Laboratory studies again demonstrated that cotton seedlings take blackarm much more readily when turgid than when partially wilted [ibid., xvi, p. 68].

Leaf curl was noticed as early as 24th September, corresponding with the early breeding of the whiteflies [*Bemisia gossypiperda*]. Spread, however, was slow, and finally the percentage of infection even lower than in the previous season.

No general outbreak of wilt [ibid., xiv, p. 756] occurred, but the presence of discoloured seed-cotton in the terminal bolls indicated the occurrence of disturbances in the underground parts.

The evidence obtained in two widely different, successive seasons indicated that in the Gezira a disturbance to the root system of the cotton crop takes place between the end of September and the beginning of December. The finest rootlets decay and are attacked by fungi. The extent of the damage varies in different soils, and is symptomatic of the physical nature of the soil and its reaction. The mycorrhizal fungus [ibid., xiv, p. 756] was present, but it had no adverse effect on root development. No other organisms were found to any great extent until late in October. Isolations from 5- to 9-days-old wilted seedlings then gave *Pythium graminicolum* [ibid., xv, pp. 137, 465], *P.* sp. section *Aphragmium* (?*P. afertile* Kanouse & Humphrey), and *P. aphanidermatum.* Isolations from the fine rootlets of plants not visibly wilted, in August and September, also yielded various species of *Fusarium*, of which *F. solani* var. *minus* was the commonest, as well as *Rhizoctonia* [*Corticium*] *solani*, *Macrophomina phaseoli*, a slow-growing, as yet unidentified fungus labelled 'XT', *F. vasinfectum* var. *inodoratum*, *Ascochyta gossypii*, and *Moniliopsis aderholdi*, found inside unhealthy roots, and considered to be probably a weak parasite.

When cultures of these fungi were added to the sand in which cotton seedlings were grown in the laboratory under normal temperature and moisture conditions, *P. aphanidermatum* often produced death in a few days, but, while certain of the others penetrated rootlets, none was strongly parasitic. Addition of 0·1 per cent. sodium carbonate severely damaged the root system in the presence or absence of fungi. Without the carbonate the fungi caused little damage, though commonly invading the finest rootlets. The plants exhibited marked resistance as long as aeration of the roots remained satisfactory.

Observations on cylinders of soil in which the original tilth was maintained showed that in many instances the uppermost layers become compacted under irrigation, forming a seal which rapidly grows increasingly impermeable to air and water. This sealing of the subsoil, to which the puddling produced in the upper layers by heavy rain also contributes, is considered to be responsible for the root disturbance. The methods of cultivation practised in the Gezira are not deep enough to admit air to the lower layers, especially in October, when the crop has attained a considerable size. Cotton withstands waterlogging well

if the water is aerated, and the algae in the Blue Nile are thought to play an important part in preventing root asphyxiation when cotton is over-watered. Occurring as they do at a critical growth phase, the root disturbances are probably largely responsible for the low yields in the Gezira. After a date which varies somewhat annually, very little recovery is possible from maltreatment in the earlier growth stages. Work in 1935–6 confirmed in general these observations.

ANDREWS (F. W.). **The effect of leaf curl disease on the yield of the Cotton plant.**—*Emp. Cott. Gr. Rev.*, xiii, 4, pp. 287–293, 1 graph, 1936.

To estimate the effect on yield of cotton leaf curl [see preceding abstract] a small plot of Sakel cotton was sown on 15th October, 1932, instead of at the normal time about the beginning of August, so that the plants developed at the period when the disease was rapidly decreasing and the selection of comparative pairs of healthy and infected plants for observation could readily be made. In all, 88 comparable pairs were secured. On 27th March, 1933, the plants were cut out at ground-level, and the following records obtained. The total numbers of green bolls, open bolls, and buds and flowers on the 88 diseased plants were, respectively, 558, 243, and 157, while on the healthy plants the corresponding figures were 1087, 473, and 164, the relative percentage reductions due to the disease being, respectively, 48·6, 48·6, and 4·3. In the healthy plants the average fresh weight per plant, unit weight of green bolls, and average weight of seed cotton per unit open boll were, respectively, 236·3, 6·2, and 1·47 gm., the corresponding figures for the infected plants being 126·8, 5·8, and 1·37 gm. In the healthy and diseased plants, respectively, the fresh weight of the stems and leaves per plant amounted to 140·9 and 102·8 gm., the percentages of green and open bolls in the former being 69·6 and 60·3, respectively, and in the latter 69·5 and 30·4.

The disease thus caused a significant reduction in the fresh weight of the infected plants and a considerable decrease in their fruit production. The data suggest that the full effects of the disease were apparent only in the green bolls, and that infection occurred too late to cause any significant decrease in the unit weight of seed cotton in the open bolls. Since the plants were sown out of season the loss of cotton cannot be taken as representing the normal reduction due to the disease.

LEROY (J. V.). **Observations relatives à quelques Hémiptères du Cotonnier.** [Observations on some Cotton Hemiptera.]—*Publ. Inst. nat. Étud. agron. Congo Belge*, Sér. sci., 10, 20 pp., 18 col. pl., 9 figs., 1936.

The author presents experimental data showing that *Lygus vosseleri* is responsible for the malformation of cotton known in the Belgian Congo as frisolée [ibid., xv, p. 147], which appears to be the same as that described by O. F. Cook as tomosis [loc. cit.]. A marginal rolling of the leaves towards the base, with a reddish coloration, is attributed to *Empoasca fascialis*, and cankers on the stems, leaves, and capsules to *Helopeltis bergrothi* [ibid., xv, p. 499].

NEAL (D. C.) & COLLINS (E. R.). **Concentration of ammonia necessary in a low-lime phase of Houston clay soil to kill the Cotton root-rot fungus, Phymatotrichum omnivorum.**—*Phytopathology*, xxvi, 10, pp. 1030–1032, 1936.

In order to obtain an idea of the concentration of ammonia necessary to destroy the cotton root-rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xv, p. 718] in low-lime Houston clay (black belt) soils in Texas [ibid., xiii, p. 92], laboratory experiments involving soil treatments with ammonia water and subsequent inoculations with the fungus were conducted in the spring of 1935, 750 gm. of soil being used for each concentration of ammonia tested from 300 to 1,325 p.p.m. in increments of 75 p.p.m. The results of the tests indicated that the effective initial concentration of ammonia in the soil lies in the range of 900 to 1,025 p.p.m.—a marked contrast to the low strengths required for the destruction of the mycelium and sclerotia of the fungus (50 and 300 p.p.m., respectively) in Erlenmeyer flasks.

ROGERS (C. H.). **Cotton root-rot and weeds in native hay meadows of central Texas.**—*J. Amer. Soc. Agron.*, xxviii, 10, pp. 820–823, 1936.

The root-rot fungus, *Phymatotrichum omnivorum* [see preceding abstract], is stated to have been repeatedly found destroying plants in undisturbed blackland prairies [*R.A.M.*, xv, p. 577]. Vigorous sclerotia of the fungus were found at 1-, 2-, and 3-ft. depths in the soil in one such meadow in the western edge of Falls County. Of a total of 47 plant species present in the meadow, 37 were more or less susceptible to *P. omnivorum*, including *Aster multiflorus, Daucus pusillus, Delphinium albescens,* two species of *Gaillardia, Geranium carolinianum, Lathyrus pusillus, Lupinus texensis* [*L. subcarnosus*], *Oenothera missouriensis, Physalis mollis, Solanum carolinense, S. elaeagnifolium,* and *Vicia leavenworthii*. Among the seven resistant forage grasses were *Andropogon furcatus, A. scoparius, Bromus catharticus,* and *Hordeum pusillum*. A number of additional plants were found to be susceptible in other prairie meadows, including two species of sunflower (*Helianthus maximiliani* and *H. annuus*) and *Solidago altissima* [*S. pilosa*].

The maintenance of meadows and pastures free of weeds is recommended as a means of starving out the root-rot fungus.

DRECHSLER (C.). **A Fusarium-like species of Dactyella capturing and consuming testaceous rhizopods.**—*J. Wash. Acad. Sci.*, xxvi, 10, pp. 397–404, 1 fig., 1936.

Latin and English diagnoses, supplemented by a full discussion of the morphology and taxonomy of the organism, are given of *Dactyella passalopaga* n.sp., found capturing and consuming the testaceous rhizopods *Geococcus vulgaris* and *Euglypha laevis* in agar plate cultures from decaying plant roots, soil, and leaf mould in Maryland [cf. *R.A.M.*, xiv, p. 508; xv, p. 720].

SHREWSBURY (J. F. D.). **Secondary thrush of the bronchi.**—*Quart. J. Med.*, N.S., v, 19, pp. 375–397, 1936.

The writer fully describes and discusses in relation to contemporary

researches the results of his observations, covering a three-year period, on the disease to which Castellani has applied the name of 'bronchomoniliasis' and attributes to species of *Monilia* [*Candida*]. On the basis of the data here presented the disorder in question, as understood by Castellani, does not exist in England, where, however, secondary thrush infections of the bronchi due to *M.* [*C.*] *albicans* [see next abstracts] undoubtedly do occur and are of some importance on account of the additional strain which they tend to throw on the respiratory mechanism [cf. *R.A.M.*, xii, p. 692 *et passim*]. This fungus is commonly present in human sputum, irrespective of the nature of the primary pulmonary disease. In the writer's opinion, the organisms grouped by Castellani under *Monilia* are merely strains of *C. albicans*.

IKEDA (K.). **Bronchopulmonary moniliasis: its relation to obscure chronic pulmonary infection.**—*Arch. Path. Lab. Med.*, xxii, 1, pp. 62–81, 5 figs., 1936.

Since Castellani's observations in 1905 on bronchopulmonary moniliasis among Cingalese tea workers, this condition has been regarded as a clinical entity. In the present study attention is drawn to the existence of an apparent relationship between a pathogenic species of *Monilia* (*M.* [*Candida*] *albicans*) [*R.A.M.*, xvi, pp. 40, 99] and chronic interstitial pneumonia of obscure etiology, associated with bronchiectasis and abscesses. The results of the writer's investigations further suggest a sequential relation of a certain type of chronic bronchial asthma to bronchopulmonary moniliasis [cf. preceding abstract], the former representing an early phase of the latter. *C. albicans* may therefore be considered as an important etiological factor in the development of obscure bronchopulmonary infection, but whether it is the sole cause of the disease cannot be stated on the basis of present evidence.

HOPKINS (E. W.) & HESSELTINE (H. C.). **Cultural and morphological studies of Cryptococci and Monilias isolated from vulvovaginitis and oral thrush.**—*J. Lab. clin. Med.*, xxi, 11, pp. 1113–1118, 1936.

Fermentation groups were determined in 8 *Cryptococcus* [*R.A.M.*, xv, p. 367] and 73 *Monilia* strains isolated from cases of vulvovaginitis and oral thrush. Of the 35 strains biochemically classifiable as *M.* [*C.*] *albicans* [see preceding and next abstracts], 31 belong morphologically to this species, two are referable to *M. candida* [*C. vulgaris*], and two probably to *M.* [*C.*] *krusei* [ibid., xv, p. 439]. Cultural characters of the three types are described.

BEARSE (C.) & POLLOCK (L. H.). **Mycotic infection of the stomach: report of a case with perforation.**—*Ann. Surg.*, civ, 2, pp. 167–174, 1 fig., 1936.

Full clinical details are given of a fatal case of abdominal abscess and gastric fistula in a 24-year-old American negress, associated in what is believed to have been an etiological relationship with *Monilia* [*Candida*] *albicans* [see preceding and next abstracts].

PERSONS (E. L.) & MARTIN (D. S.). **Passive transfer antibodies for six saprophytic fungi in a patient with a superficial scaling dermatosis.** —*J. clin. Invest.*, xv, 4, pp. 429–434, 1936.

A 33-year-old man, without any family history of hypersensitiveness, developed a generalized scaling dermatosis some 5 weeks after the appearance of an epidermal reaction round a pustule on the thigh. Cultures from the initial lesion, after the development of the dermatosis, yielded Benham's pink *Cryptococcus* [*R.A.M.*, xv, p. 153], *Cladosporium herbarum*, *C.* sp., *Penicillium roseo-citreum*, *Aspergillus fumigatus* [ibid., xv, p. 20 *et passim*], *Nigrospora* sp., and an unidentifiable fungus with a sterile mycelium. Skin tests with saline suspensions of heat-killed organisms from 48-hour growths on Sabouraud's glucose agar slants resulted in immediate reactions to all the strains except the *Cryptococcus.* Cutaneous sensitivity to each of the six fungi was passively transferred to the skin of three normal persons. Passive transfer tests were positive in two out of three subjects to *Alternaria* (from dust) [cf. ibid., ix, p. 384] and in two to *Monilia* [*Candida*] *albicans* [see preceding and next abstracts] extract 1 : 100.

There is reason to believe that hypersensitivity to moulds was an important factor in the development of dermatosis in the writers' patient, and it would appear from the evidence here presented that saprophytic fungi should be regarded as possible incitants of allergic dermatoses, as well as of hay-fever [ibid., x, p. 313 *et passim*] and asthma [ibid., xiii, p. 370 *et passim*].

WORLEY (G.) & STOVALL (W. D.). **A study of milk coagulation as a differential feature of Monilia albicans and Monilia candida.**—*Proc. Soc. exp. Biol., N.Y.*, xxxv, 1, pp. 165–168, 1936.

A definite biological difference was shown to exist between *Monilia* [*Candida*] *albicans* [see preceding abstracts] and *M. candida* [*Candida vulgaris*: *R.A.M.*, xvi, pp. 40, 99] in respect of milk coagulation, a process readily effected by the former but not by the latter.

MOSHER (W. A.), SAUNDERS (D. H.), KINGERY (L. B.), & WILLIAMS (R. J.). **Nutritional requirements of the pathogenic mold Trichophyton interdigitale.**—*Plant Physiol.*, xi, 4, pp. 795–806, 1936.

A tabulated account is given of the writers' studies on the amino acid, carbohydrate, nutrilite (vitamin-like substances), and mineral requirements of *Trichophyton interdigitale* [*R.A.M.*, xvi, p. 101]. The fungus proved incapable of growth on a synthetic medium unless supplied with certain amino acids, preferably in the form of a varied assortment comprising the almost indispensable leucine, aspartic acid (or asparagin), and α-amino-β hydroxy-n-butyric acid (Rose). All the more common sugars tested were utilized by the fungus except lactose, but the best growth was afforded by mannose. *T. interdigitale* further requires, in addition to the foregoing, at least one of the growth-promoting substances, pantothenic acid, crystalline vitamin B [ibid., xv, p. 170], or a lactoflavin preparation. An extension of the growth period can be secured by the use of an abundance of phosphate as a buffer in the nutrient solution.

MASCHKILLEISSON (L. N.). **Zur Frage über Trichophytia superficialis capillitii adultorum.** [A contribution to the question of superficial trichophytosis of the scalp in adults.]—*Derm. Wschr.*, cii, 24, pp. 765–769, 5 figs., 1936.

Apart from 606 cases of superficial trichophytosis and microsporosis of the scalp among adults recorded down to 1934 the writer has personally examined 53 patients (all female) between the ages of 18 and 69 affected by this disorder in the Moscow and Voronezh districts of the U.S.S.R. Cultures from 24 of these cases yielded *Trichophyton violaceum* [*R.A.M.*, xvi, p. 101] (18), *T. gypseum* [ibid., xv, p. 650] (4), *T. niveum* [ibid., xv, pp. 222, 501] (1), and *T. crateriforme* [ibid., xv, pp. 218, 580] (1). The relationship of the condition to various pathological and constitutional factors is briefly discussed.

NICOLAS (J.), MASSIA (G.), ROUSSET (J.), & COLAS (J.). **Onychomycose du gros orteil.** [Onychomycosis of the big toe.]—*Bull. Soc. franç. Derm. Syph., 1936* (i), 5, pp. 924–926, 2 figs., 1936.

Details are given of case of onychomycosis of the left big toe, in an elderly male patient, associated with infection by *Scopulariopsis brevicaulis* [*R.A.M.*, xv, p. 581].

ARTOM (M.). **Onicomicosi da Scopulariopsis brevicaulis (varietà hominis).** [Onychomycosis caused by *Scopulariopsis brevicaulis* var. *hominis*.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xv, 3, pp. 208–209, 1936.

From the swollen, brittle, whitish nails on both hands of an 11-year-old boy the writer isolated on Sabouraud's agar a fungus which he describes and identifies as *Scopulariopsis brevicaulis* [see preceding abstract] var. *hominis*.

HAUSAM (W.). **Ueber einen neuen, durch farbstoffbildende Mikroorganismen verursachten Schaden an Schafleder.** [On a new injury to sheepskin caused by pigment-forming micro-organisms.]—*Collegium, Haltingen*, x, 798, pp. 561–566, 15 figs., 1936.

A species of *Dematium*, forming a greenish- to tar- or lacquer-black pigment in beer wort agar cultures, liquefying gelatine, peptonizing milk, and producing a small amount of acid from galactose and dextrose, was isolated from circular, sharply-defined, greyish- to brownish-purple spots, 0·25 to 0·5 cm. in diameter, on a sheepskin. This is believed to be the first record of a *Dematium* damaging leather. The fell also bore greyish, speckled lesions due to *Aspergillus niger* and to green and yellow species of *Penicillium* [*R.A.M.*, ix, p. 316]. Infection by the *Dematium* is believed to have been contracted on the drying-floor.

GIGANTE (R.). **Una nuova virosi della Rosa in Italia.** [A new virus disease of Rose in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 76–94, 2 pl., 14 figs., 1936.

In March, 1936, Hadley, Frau Karl Druschky, His Majesty, and Oberbürgermeister roses in a garden near Rome, in which some years before a few individuals had been similarly affected, developed a serious virus disease not hitherto recorded.

The leaves at the extremity of the young branches became contorted and swollen, forming a rosette. Blackish-brown, round or polygonal spots 2 to 3 mm. in diameter appeared on the leaf blades, and circular or elliptical, light brown necrotic areas 1 to 5 mm. in diameter and sharply delimited by a thin, blackish halo formed among the spots or on the healthy part of the leaves. Defoliation set in, and dark brown areas girdled the stems and branches. The flowers were frequently deformed, and in severe cases the whole plant died. Occasionally the symptoms remained masked in new shoots for over a year.

Sap inoculations into healthy plants gave positive results in all cases, the controls remaining unaffected. Transmission was also effected in 4 out of 7 cases by means of a species of *Macrosiphum* from diseased roses. In nature the disease is apparently spread by contact wounds made by diseased plants, by contaminated pruning implements, and chiefly by *Macrosiphum* sp. A healthy plant protected by gauze covering in a greenhouse remained healthy for some time but three weeks after the removal of the covering developed the disease, and bore numerous aphids.

Control consists in adequate spacing, prompt destruction of diseased plants, disinfection of pruning implements, grafting with healthy parts only, the removal from the vicinity of wild roses, especially *Rosa indica* var. *major*, as these are highly susceptible, and insecticidal treatment.

White (H. L.). **Anther smut of perpetual-flowering Carnations.**—*Gdnrs' Chron.*, c, 2597, p. 254, 1 fig., 1936.

Ustilago violacea [*R.A.M.*, xiii, p. 453], ordinarily an unimportant pathogen of carnations, occurred in a severe form in 1936 in a nursery near London, necessitating the destruction of up to 70 per cent. of the blooms prepared for marketing. Infected flower-stalks are stunted and the developing bud is squat; later there is a marked tendency to splitting of the calyx. As many as six or eight axillary buds may be formed before the opening of the terminal one. Anther smut may be perpetuated by means either of contaminated cuttings or of spores, infection being favoured by the retention of stagnant moisture in the leaf axils and the damp atmosphere of the beds in glasshouses. Buds observed to be carrying the smut should be excised and burnt.

Rainio (A. J.). **Tutkimuksia Gladiolus-kasvien bakteeritaudeista (Pseudomonas marginata McCl., Ps. gummisudans McCl., Bacillus omnivorus Hall ja B. variegatus Rainio nov. spec.).** [Investigations on bacterial diseases of Gladioli (*Pseudomonas marginata* McCl., *Ps. gummisudans* McCl., *Bacillus omnivorus* Hall, and *B. variegatus* Rainio nov. spec.).]—*Valt. Maataloust. Julk.*, 84, 102 pp., 35 figs., 3 graphs, 1936. [German summary.]

Following an introductory survey of the available information on the history and distribution of the bacterial diseases of gladiolus, the writer discusses the occurrence in Finland of *Pseudomonas marginata* [*Bacterium marginatum*: *R.A.M.*, xiv, pp. 173, 498; xv, p. 79], *P.* [*Bact.*] *gummisudans* [ibid., xiii, p. 14], *Bacillus omnivorus* [*B. carotovorus*], revised diagnoses of which are given, and *B. variegatus* n.sp.

Bact. marginatum has been present in the country in a destructive

form for at least 20 years. An inspection of imported corms in 1931 revealed its presence in up to 80 per cent. of the material of certain consignments (average 15 per cent.). *Bact. gummisudans*, first observed in Finland in 1930, is prevalent in gardens in a mild form. In inoculation experiments it attacked the surface of the corms, as well as the leaves, producing rectangular spots. The symptoms induced by *B. carotovorus* on gladioli resemble those caused by the same organism on iris [ibid., xv, p. 99]. Two phases of the rot may be distinguished, the first originating at the time of planting the corms and terminating at the end of June, when infection spreads upwards to the shoots and destroys them, while the second commences at the end of August and involves the hitherto sound portions of the stand. Generally speaking, *B. carotovorus* is not much in evidence in imported consignments, one of which in 1930, however, contained 77 per cent. diseased corms.

B. variegatus n.sp. has evidently been introduced from abroad during recent years, being constantly present in moderate amounts among imported lots of corms. Pale, glistening spots, mostly situated between the scars formed by the dry scales, develop on the corm surface. The tissues underlying the lesions are soft, greyish-yellow, caseous, and permeated by cavities, 1 to 3 mm. in diameter, filled with a greenish-yellow exudate, which reaches the surface through canals ending in small apertures or fissures. The shoots arising from diseased corms grow slowly and the foliage bears a profusion of small, oval, raised, translucent spots, which gradually elongate and turn yellow, imparting a mosaic aspect, while a yellowish bacterial liquid is exuded from their centres. As a rule the infected plants fail to flower.

B. variegatus measures 0·8 to 1·2 by 0·4 to 0·8 μ (average 1 to 1·2 by 0·6 μ) and is motile by peritrichiate flagella, 18 μ in length; it forms on agar spherical, brownish-yellow, sulcate colonies with a metallic sheen; gelatine is slowly liquefied; the minimum, optimum, and maximum temperatures for growth are 3°, 30°, and 34° C., respectively, the thermal death-point 49°, and the minimum, optimum, and maximum P_H values 4·4, 6·2, and 9·4, respectively; the organism is aerobic, succumbs within $1\frac{1}{2}$ hours on exposure to sunlight, produces gas in abundance from glycerine, mannite, dextrose, galactose, and saccharose, forms hydrogen sulphide and indol freely, and reduces methylene blue, sodium selenite, and nitrates.

Inoculation experiments with *B. variegatus* gave positive results on gladiolus. *Bact. marginatum* was strongly pathogenic to the Ariadne, Emile, Eckesachs, and Loreley varieties of *Iris germanica*, *I. spuria*, and *Montbretia* [*Tritonia*] *crocosmifolia* [a hybrid] also being susceptible. *Bact. gummisudans* and *B. variegatus* failed to infect the Iridaceae (other than gladiolus) used in the tests, but *I. germanica*, *I. pallida*, *Hemerocallis fulva*, the above-mentioned hybrid *Tritonia*, chicory [ibid., xiii, p. 492], and *Prunella vulgaris* reacted positively to inoculations with *B. carotovorus*.

Gladioli may be protected against bacterial rot by appropriate cultural measures, including the use of sound planting stock, the selection of sunny sites on acid soil and abundant watering during the growing period, supplemented by the immersion of the corms (freed from their membranous scales) for 30 minutes one day before planting

in a solution of 0·25 to 0·5 per cent. corrosive sublimate, 0·5 per cent. potassium permanganate, or formalin (1 : 200 to 1 : 100), the last-named, however, being liable to retard germination.

Grieve (B. J.). **On the occurrence of Bacillus carotovorus Jones causing a soft rot of Iris in Victoria.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 86–89, 1 pl., 1936.

Iris germanica plants in the University grounds and private gardens at Melbourne have been observed since 1933 to suffer from a soft rot of the rhizome attributed to *Bacillus carotovorus* [see preceding abstract]. Both plants raised from bulbs of German origin and those from indigenous stocks were affected by the characteristic foliar browning and dying-off associated with a caseous consistency of the rhizome, the cut surfaces of which exude a cream-coloured liquid, and a profusion of bacteria in the wood vessels and intercellular spaces of the leaf bases. The causal organism was consistently isolated from the infected leaf bases and reproduced the disease in inoculation experiments. Certain differences between the Melbourne strain and the type *Bacillus carotovorus* (non-liquefaction of gelatine, failure to produce indol, and feeble diastatic action in the former case) are not considered to imply any significant divergence.

Ullstrup (A. J.). **Leaf blight of China Aster caused by Rhizoctonia solani.**—*Phytopathology*, xxvi, 10, pp. 981–990, 2 figs., 1 graph, 1936.

In the autumn of 1935 greenhouse China aster (*Callistephus chinensis*) plants at Princeton, New Jersey, were severely attacked by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xii, p. 175], which caused a water-soaked, later alternate light and dark brown, zonate spotting of the leaves and ultimate collapse, beginning with the lowermost and spreading down the petioles to the stem, from which the remainder of the foliage became infected. Heavily blighted leaves were frequently traversed by scattered strands of coarse mycelium. Under favourable conditions for the development of the fungus, the plants were often killed within a few days.

The culture of *C. solani* (A1) isolated from diseased aster leaves was compared with four others, viz., P 1 from potato (New Jersey), and SB 1, 2, and 3 from sugar beet [ibid., xvi, p. 150], the first two from Minnesota and the third from Michigan. The A 1 strain made no growth on potato dextrose agar at 5° C., very little at 10°, the optimum development between 25° and 30°, and an appreciable growth at 35° [ibid., xvi, p. 122]; SB 3 grew better than A 1 at the lower temperatures and also made some growth at 35° C., P 1 developed better at the lower range, declining above 25°, while SB 1 and 2 were intermediate in their temperature relationships between the potato strain and A 1.

In cross-inoculation experiments on aster, beet, and potato, A 1 was unquestionably the most virulent, SB 1, 2, and 3 produced moderate or severe infection, while P 1 was non-pathogenic under the conditions of the tests. In further inoculations on aster, beet, and *Begonia semperflorens* leaves, strains A 1 and SB 3 produced infection cushions on the

host surface which directly penetrate the cuticle. In the case of SB 1 and 2 penetration was effected only through the stomata without the intervention of infection cushions.

HARRAR (J. G.). **Cercospora leaf spot of Calendula in Virginia.**—*Plant Dis. Reptr*, xx, 17, pp. 277–278, 1936. [Mimeographed.]

Since 1933 species of *Calendula* in Virginia have been increasingly affected by a leaf spot due to *Cercospora calendulae* Sacc. The lesions sometimes coalesce into a large necrotic area, and the whole plant may become blighted. Once established the disease is liable to affect the entire planting, though seedlings under four weeks old are not attacked. The fungus is air- and soil-borne, but is not normally transmitted by the seed. Control is readily attained by the use of Bordeaux mixture, lime-sulphur, copper oxide, or sulphur dust.

WHITE (H. L.). **On Verticillium wilt of the perpetual-flowering Carnation.**—*J. Pomol.*, xiv, 3, pp. 216–226, 1936.

In further studies on carnation wilt (*Verticillium cinerescens*) [a preliminary account of which has already been noticed: *R.A.M.*, xv, p. 654] more than 80 per cent. of the isolations from 10 plants, using woody tissue taken not less than 3 ft. above the main limbs, yielded the causal fungus only. Isolations from the region of the collar commonly yielded *Fusarium culmorum* [loc. cit.].

From one nursery 15 plants showing stem rot each yielded *Fusarium dianthi* [loc. cit.], mostly free from other organisms though *F. culmorum* was common. When comparative inoculations were made with *V. cinerescens*, *F. culmorum*, and *F. dianthi*, the first caused a rapid wilt, characterized by rotting of all the stem tissues, while the second and third induced a slower wilt, associated with extensive vascular infection. All three were readily reisolated some distance away from the site of inoculation. Plants infected by *V. cinerescens* are not usually stunted, and the extensive vascular browning present is not associated with cortex and pith lesions; the plants show longitudinal zonation of the diseased woody tissues with gradual merging of the diseased and healthy wood, and the dried stems are firm to the touch. Plants infected by *F. dianthi* show distortion and stunting of the young shoots together with extensive vascular lesions with a shredded, silvery appearance. The dried stems tend to yield to pressure as if they are hollow. Longitudinal zonation of the diseased woody tissues is present, with sharp demarcation between the healthy and diseased wood. *F. culmorum* causes wilting of the shoots as a whole, with generalized rotting of the pith, cortex, and wood.

In discussing possible means of control the author suggests steam sterilization of the soil, supervision of the water-supply, and avoidance of the transfer of contaminated soil on tools and hoses. The growing of a generation in pots for propagation exclusively might be undertaken for the purpose of cleaning stock, variety by variety, and should be an essential precaution in the propagation of stock from new varieties from other nurseries, which should be confined for this purpose to a quarantine house.

Brown (A. M.). **Studies on the interfertility of four strains of Puccinia helianthi Schw.**—*Canad. J. Res.*, xiv, 10, pp. 361–367, 1 pl., 1936.

In a study on the crossing behaviour of *Puccinia helianthi* [*R.A.M.*, xv, p. 421] inoculation experiments on 6 species of *Helianthus* showed that 4 distinct strains of the fungus were present on *H. annuus*, *H. petiolaris*, *H. tuberosus*, and *H. subtuberosus*, respectively. The strain from *H. annuus* produced the same types of infection on *H. annuus*, *H. tuberosus*, and *H. maximiliani*, and is probably identical with Bailey's race (form) 1 [ibid., iii, p. 401].

All possible combinations of reciprocal crosses, either by transference of pycnidial nectar or by the diploidization of haploid pustules with uredospore (diploid) mycelium were made among the four strains, which on a basis of their infertility fell into two groups, the first (A) consisting of the strains on *H. annuus* and *H. petiolaris*, and the second (B) of those on *H. tuberosus* and *H. subtuberosus*. The two strains of each group were highly interfertile, though the strains of one group were highly intersterile with those of the other. The similarity of the crossing behaviour of the two groups to that of certain varieties of *P. graminis* suggests that each group of *P. helianthi* represents a variety.

Remsberg (Ruth) & Hungerford (C. W.). **Black stem of Alfalfa in Idaho.**—*Phytopathology*, xxvi, 10, pp. 1015–1020, 1 fig., 1936.

The 'black stem' disease of lucerne in Idaho [*R.A.M.*, xvi, p. 22] appears to be identical with that reported under the same name from Kentucky, the causal organism in both cases being *Phoma medicaginis*. Grown on sweet clover [*Melilotus alba*] stems, the fungus produced an ascigerous stage corresponding to *Pleospora rehmiana*, which was also found on old lucerne stems in the field. Ascospore isolations from the cultural perithecia and from natural material produced the imperfect stage of the fungus, and greenhouse inoculations with *P. rehmiana* on Common and Grimm lucerne and yellow-blossom *M. alba* resulted in the development of typical black stem lesions, from which *Phoma medicaginis* was reisolated. It is apparent from these data that *Pleospora rehmiana* is the perfect stage of *Phoma medicaginis*; the ascospores of the fungus evidently serve as inoculum in the field during the spring, when the perithecia were observed to be present on overwintered tissue.

Rainio (A. J.). **Über die Dilophospora-Krankheit von Phleum pratense L. und Alopecurus pratensis L.** [On the *Dilophospora* disease of *Phleum pratense* L. and *Alopecurus pratensis* L.]—*Valt. Maatalousk. Julk.*, 87, 32 pp., 8 figs., 1936. [Finnish summary.]

Dilophospora alopecuri is commonly found in Finland forming on *Phleum pratense*, *Alopecurus pratensis*, and wheat [*R.A.M.*, xiv, p. 296] leaves and leaf sheaths small, circular, light brown or reddish spots (the centres later turning white) containing an endophytic mycelium which gives rise to the first conidial stage of the fungus, known as *Mastigosporium album* [ibid., xvi, p. 31]. Close examination of the epiphytic mycelium covering the leaves and ears of infected wheat showed here and there filiform conidia, 35 by 2·5 μ in diameter, compared with the usual spindle shaped ones, 54 by 12 μ, but provided with

the characteristic appendages. When conidia of the latter type are placed on artificial nutrient media they produce the filiform conidia, and after a month pycnidia of *D. alopecuri*. An abundance of nitrogen in the substratum promoted the development of *M. album*, while the presence of carbohydrates favoured the growth of the *D. alopecuri* stage.

The conidia lost their viability in about four months at laboratory temperature while that of the pycnospores was retained for two years. The latter organs are well able to withstand the winter temperatures prevailing in Finland. The aerial mycelium can survive a temperature of —10° C. whereas one of —3° kills the conidia. The pycnospores overwintering on the surface of the seed, however, are incapable of infecting the plants owing to the slow germination of the spores and consequent failure of the hyphae to penetrate the growing-point at the critical stage. Infection takes place by means of the mycelium hibernating in the interior of the seed and penetrating the germinating embryo. Air currents and insects (mainly the former) convey the conidia from the surface of the ground or from diseased plant organs to the young leaves and ears, where germination and subsequent infection occurs, usually during the flowering period.

Positive results were given by inoculation experiments with pure cultures (oatmeal agar) of the fungus from *P. pratense* on wheat, spelt, barley, oats, rye, *Setaria italica*, *S. viridis*, *Dactylis glomerata*, *Festuca pratensis*, *Hordeum murinum*, *Lolium perenne*, *L. temulentum*, *Panicum crus-galli*, *Triticum* [*Agropyron*] *repens*, and a number of other grasses.

KIDD (F.) & WEST (C.). **Gas storage of fruit. IV. Cox's Orange Pippin Apples.**—*J. Pomol.*, xiv, 3, pp. 276–294, 2 pl., 1 graph, 1936.

In gas storage experiments conducted from 1931 to 1934 at the Ditton Laboratory with Cox's Orange Pippin apples [*R.A.M.*, xiii, p. 35], low temperature breakdown [ibid., xv, p. 301] occurred only at 34° F., severity increasing with rising concentrations of carbon dioxide in the storage atmosphere and increased duration of storage.

No brown heart [ibid., xv, p. 300] developed in the fruit stored in air. In the presence of 5 per cent. carbon dioxide the disease developed only at 50°, and in the first season (1931–2) only. In mixtures containing 10 per cent. carbon dioxide there was considerable brown heart in the first season at 34° and 50°, but practically none at 39°, whereas in the second season (1932–3) only a trace was present at any of these temperatures. With 15 per cent. carbon dioxide, brown heart was severe in both seasons. The disease may therefore be regarded as an effect of exposure to carbon dioxide. The fruit becomes affected early in its storage life, and with the variety tested the risk of injury rules out the use of carbon dioxide concentrations exceeding 5 per cent. at 34° or 10 per cent. at 39°, while at 50° there is danger even with 5 per cent. of the gas.

The type of flesh browning confined to the core region, 'core flush' [ibid., xiii, p. 108], increased with increasing concentration of oxygen; carbon dioxide did not appear to play any important part in its causation. Two seasons' results showed that an atmosphere containing 2·5

per cent. oxygen and 5 per cent. carbon dioxide at 34° or 39° was completely satisfactory as regards this condition.

The occurrence of fungal wastage was extremely erratic, little obvious relationship being found between it and the atmospheric conditions tested.

Within the limits of the experiments the maximum storage life of Cox's Orange Pippin apples was obtained at 39° in an atmosphere containing 2·5 per cent. oxygen and 5 per cent. carbon dioxide.

ASKEW (H. O.), CHITTENDEN (E.), & THOMSON (R. H. K.). **The use of borax in the control of 'internal cork' of Apples.**—*J. Pomol.*, xiv, 3, pp. 227–245, 3 graphs, 1936.

In this paper [parts II and III of which are by the first two authors only] describing further investigations in New Zealand into the connexion between apple internal cork and boron deficiency [*R.A.M.*, xiv, p. 770; xv, p. 446] it is stated that observations of the penetration of borax used as a top-dressing in typical orchard areas on several soil-types showed it to be relatively rapid. Laboratory experiments in which soil was shaken with borax solutions demonstrated that some fixation of boron occurs, the amount varying considerably in different soils, so that the rate of penetration also varies.

Detailed studies throughout the growing season showed that the boron content of Jonathan apples growing in a severely affected orchard at Braeburn decreased steadily from relatively high values (33·0 p.p.m.) for the young fruits to relatively low ones (8·9) for fruits at the export picking stage, whereas in a part of the orchard treated with 100 lb. borax per acre the content fell from 21·5 to 17·5 p.p.m. In a healthy orchard at Stoke the corresponding figures were 29·2 and 13·5 p.p.m. In another badly diseased orchard of Dougherty apples at Umukuri the boron content of the untreated fruit fell from 9·4 to 4·1 p.p.m. compared with 17·3 and 15·2 p.p.m. for the portion treated with ½ lb. borax per tree, and with 43·9 and 17·6 p.p.m. for Dougherty apples from a healthy area at Stoke.

Further data from six apple varieties in six orchards showed that the use of borax markedly increased the boron content of the leaves and fruit, and even when the boron content reached 30·6 p.p.m. no toxic effects resulted. The evidence indicated that the trees meet the boron requirements of the leaves first; when boron is deficient, the content in the fruits falls long before any appreciable decline occurs in the leaves. Borax applications did not improve the vegetative condition of the trees, but in all cases they practically eliminated internal cork. The rate of intake of boron in the average Jonathan and Dougherty apples increased parallel with the size of the fruits until the end of the experiment, when it slowed down. On the untreated areas the rate of intake fell to nearly zero towards the end of the period.

The data obtained showed that the normal annual requirement of an apple orchard for leaf and fruit growth is only approximately 14 oz. borax per acre. The use of ½ to 1 lb. hydrated borax per tree, or 50 to 100 lb. per acre, broadcast, is safe and gives satisfactory control of internal cork.

Spraying with 0·1, 0·5, and 1 per cent. borax solutions controlled the

disturbance. As boron absorption depends on retention on the leaves, two sprays of 0·25 per cent. borax applied during November at an interval of 20 days are recommended for commercial practice. Preliminary trials did not indicate that any objectionable results follow the introduction of the borax into the lime-sulphur sprays used at this period of the year.

The treatment of Jonathan and Delicious trees in full leaf in a badly affected orchard by injections of 2·5 or 5 gm. hydrated borax in the form of 0·25 per cent. solution gave complete control of internal cork in all cases, whilst the untreated Jonathan trees showed 94·22 per cent. fruit with internal cork and Delicious 9·0 per cent. Single trees of each variety injected in one limb with 5 gm. borax yielded no fruit with internal cork on the injected limbs, as against 4 and 7 per cent. on the other branches of the Jonathan and Delicious trees, respectively. A measurable amount of boron was found to have migrated to the untreated branches.

[This paper is also published in *N. Z. J. Sci. Tech.*, xviii, 4, pp. 365–380, 3 graphs, 1936.]

Codlin moth and black spot. Control measures for Apples and Pears.—*Fruit World, Melbourne*, xxxvii, 9, p. 5, 1936.

The spray programmes recommended by the Victorian Department of Agriculture for the control of codlin moth [*Cydia pomonella*] and black spot [scab: *Venturia inaequalis*] on apples are: schedule 1, at the green tip stage, Bordeaux mixture 6–4–40, early pink stage 3–3–50, followed by 6 or 7 lead arsenate plus Bordeaux (6 oz.–6 oz.–80) plus lime casein (½ to 1 lb. per 80 galls.) sprays; schedules 2 and 3 (for use on varieties liable to russet) are the same, but in place of the early pink application lime-sulphur is applied at the blossom stage, petal fall, and again fourteen days later in addition to arsenate sprays. Against pear scab [*V. pirina*: *R.A.M.*, xvi, p. 47] and codlin moth the usual Bordeaux schedule is followed by application of lead arsenate. On the Josephine variety only one Bordeaux spray 6–4–40 should be given, at the green tip stage. With Winter Nelis the second Bordeaux spray must be applied before any petals show pink.

SCHMIDT (M.). **Venturia inaequalis (Cooke) Aderhold. VI. Zur Frage nach dem Vorkommen physiologisch spezialisierter Rassen beim Erreger des Apfelschorfes. Erste Mitteilung.** [*Venturia inaequalis* (Cooke) Aderhold. VI. First note on the question of the occurrence of physiologically specialized strains in the agent of Apple scab.]—*Gartenbauwiss.*, x, 4, pp. 478–499, 1 fig., 1 diag., 1936.

A tabulated account is given of cross-inoculation experiments on apple varieties and *Malus* [*Pyrus*] spp. with monospore cultures of *Venturia inaequalis*, the results of which confirmed the conclusion drawn from previous tests [*R.A.M.*, xvi, p. 45] as to the liability of a given host to infection by a large number of distinct strains. Each of 14 apple varieties (comprising a test assortment) was inoculated with monospore cultures from all the representatives of the group, with the result that, in most cases, a given strain proved pathogenic to some of the hosts and not to others. None of the strains agreed in their pathogenicity towards

the same hosts, so that the test assortment furnishes a means of characterizing the specific degree of virulence of the various fungal types. The results of trials with material from different parts of Germany and from Wädenswil (Switzerland) conformed in general with those obtained with the corresponding local Müncheberg strains. Morphologically distinct cultures from a tree of the same variety showed differences in pathogenicity towards certain hosts.

Ernst Bosch and a form of Antonovka were the only two varieties showing resistance to a relatively high proportion of the strains used in the tests, all of which were able, on the other hand, to infect Landsberg Pippin, while Winter Golden Pearmain was attacked by the majority. Among the species of *Pyrus* reacting positively to inoculation with cultures of *V. inaequalis* from cultivated apples were *M.* [*P. pulcherrima* var.] *arnoldiana, M.* [*P.*] *baccata, M. cerasifera* [*P. divaricata*], *M.* [*P.*] *ioensis plena, M.* [*P.*] *prunifolia,* and the Hislop crab-apple; *M.* [*P.*] *spectabilis* was virtually immune from infection from any of the test sources and has so far remained free from attack in the field at Müncheberg. Winter Golden Pearmain, Antonovka, and Landsberg Pippin contracted infection as a result of inoculation with cultures of *V. inaequalis* from several species of *Pyrus*, while Ernst Bosch again showed a marked degree of resistance. The weak reaction of certain apple varieties and *P.* spp. to the strains of scab used in these experiments was expressed by the development of chlorotic lesions, often having a brown, necrotic centre but bearing few or no conidia.

The outcome of these trials is interpreted as demonstrating the existence of physiologic specialization in *V. inaequalis.*

LOEWEL (E. L.). **Die Apfelblüte als Spritztermin.** [The Apple blossom as spraying indicator.]—*Gartenbauwiss.*, x, 2, pp. 232–246, 4 figs., 1936.

The results [which are fully discussed and tabulated] of experiments conducted in 1934–5 in the control of apple scab (*Fusicladium*) [*Venturia inaequalis*] by the standard methods in use in the Altenland district of Germany [*R.A.M.*, xiv, p. 517] clearly demonstrated the superior efficacy of the treatments applied during blossoming to those given earlier or later, the most propitious moment apparently being when the central flower of a cluster is fully expanded. None of the varieties included in the tests (Beauty of Boskoop, Boiken, Signe Tillisch, Schur, Bell, and others) sustained any damage from the treatments, and the only problem remaining to be solved in this connexion is their possible deleterious influence on bees [see next abstract]. Until this urgent question is finally settled growers should not spray while the trees are actually in flower.

LOEWEL (E. L.) & LÜTTGAU (W.). **Obstbaumspritzung und Bienensterben im Altländer Obstbaugebiet.** [Fruit tree-spraying and bee mortality in the Altland orchard region.]—*Gartenbauwiss.*, x, 4, pp. 521–536, 1 fig., 1 graph, 1936.

Daily counts of the mortality figures in beehives situated in north German orchards, where spraying against *Fusicladium* on apple, pear, and cherry [*Venturia inaequalis, V. pirina,* and *V. cerasi*] is regularly

practised, showed sharp rises following applications (particularly the third and fourth post-blossom) of lime-sulphur and copper-containing preparations, with or without the admixture of arsenic [see preceding abstract]. Similar results attended the feeding of the bees with these mixtures under controlled conditions. No injury was caused by a combination of 2 per cent. lime-sulphur and 0·2 per cent. alvesco or by the latter alone, but adequate control of the above-mentioned diseases cannot be secured by these methods. In view of the heavy losses sustained both by fruit-growers and beekeepers under the existing conditions (the former being liable to heavy claims for damages), it is essential to devise a spraying schedule combining toxicity to the scab pathogens with absolute harmlessness to bees.

JAMALAINEN (E. A.). **Omenapuiden lehtien ja hedelmien ruiskutusvioituksista.** [Spraying injuries to Apple leaves and fruits.]—*Valt. Maatalousk. Julk.*, 83, 35 pp., 12 figs., 2 diags., 1936. [German summary.]

Considerable damage is stated to be inflicted on the leaves and fruits of apples in Finland by Bordeaux mixture, lime-sulphur, and arsenical preparations used in spraying operations [*R.A.M.*, xv, p. 727]. The injuries thus induced may assume various forms, including a dark purplish, red, or dark brown spotting of the leaves, foliar chlorosis (yellow leaf) [ibid., xii, p. 29], shrivelling and distortion of the foliage, and black lesions on the fruit, sometimes penetrating the flesh and in severe cases causing premature dropping. Of the preparations tested an acid Bordeaux mixture (10 gm.–5 gm.–1 l.) caused the most serious damage, the effects of which were noticeable two to four days after application. The White Nalif variety proved to be highly susceptible to spray injury, even the ordinarily less deleterious lime-sulphur-lead arsenate mixture impairing the quality of the fruits. Other varieties very liable to Bordeaux injury include Autumn Redstreak, Astrachan, and Antonovka; these should be treated exclusively with lime-sulphur. The latter preparation being comparatively ineffectual, however, against *Fusicladium* [*Venturia inaequalis*: see preceding abstracts], Bordeaux mixture should be applied to all scab-susceptible varieties that can tolerate it at concentrations of 1 per cent. before and 0·5 per cent. after blossoming.

BAKER (K. F.) & HEALD (F. D.). **The effect of certain cultural and handling practices on the resistance of Apples to Penicillium expansum.**—*Phytopathology*, xxvi, 10, pp. 932–948, 1936.

The rate of advance of blue mould (*Penicillium expansum*) decay in Delicious and Winesap apples [*R.A.M.*, xvi, p. 43] in Washington was found to be slightly more rapid in fruit from trees in fertilized plots than in the untreated controls, and in apples picked at prime as compared with those gathered at early maturity. The duration of storage did not influence the rate of decay until after 180 days, when it materially increased. The number of lenticel infections by *P. expansum* per apple was higher in fruit picked at prime than at early maturity. The incidence of such infections was unaffected by the application of orchard fertilizers and by the length of the storage period up to 180

days, after which a slight increase was sometimes shown. The Winesap variety was more resistant than Delicious to lenticel infection by *P. expansum* and to the radial advance of the fungus in the tissues. A detailed consideration of methods for the prevention of blue mould decay under local conditions has been presented elsewhere [ibid., xiii, p. 781].

HAMILTON (J. M.). **Cedar rust and its control in the Hudson Valley.**—*Proc. N.Y. St. Hort. Soc.*, lxxxi, pp. 216–221, 1936.

A semi-popular account is given of the symptoms and life-history of the cedar rusts (*Gymnosporangium juniperi-virginianae* [*R.A.M.*, xvi, pp. 21, 75], *G. globosum* [ibid., xv, p. 512], and *G. clavipes* [ibid., xv, p. 159]), the increasing prevalence of which in apple orchards is a cause of serious concern to Hudson Valley growers. The incubation period of *G. juniperi-virginianae* on the apple ranges from 6 to 14 days, and a further 72 days must elapse before spores are produced on the fruit to reinfect the cedars [*Juniperus virginiana*], two years on which are then necessary for the maturation of the galls and the liberation of spores to attack the apple. Spore discharge from the galls takes place during the warm rains of early May at a minimum temperature range of 50° to 60° F. For the effective control of cedar rusts it is necessary to spray at 7- to 10-day intervals, the most promising of the materials so far tested being flotation sulphur paste (Camden) and kolofog with a bentonite [ibid., xv, p. 594] sticker. Should these measures prove impracticable, the disease may be controlled for commercial purposes by the complete eradication of cedars from a radius of half a mile round the apple orchard, though complete elimination of infection cannot be guaranteed by this method, since the spores may be carried for several miles by the wind under favourable weather conditions.

LOPATIN (M. I.). Монилиальный ожог Яблонь—**Sclerotinia fructigena Schröt.** [Blossom blight of Apples caused by *Sclerotinia fructigena* Schröt.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 103–107, 1936. [English summary.]

An account is given of a severe outbreak in the wet and warm spring of 1933, of blossom blight on Saffron Pippin apple trees in Uman [province of Kieff], attributed to *Sclerotinia fructigena* [*R.A.M.*, xv, p. 531: but the conidial pustules of which are stated to be greyish-white]. In its symptoms [which are described in detail] the disease is very similar to that caused by *S. cinerea* [*S. laxa*, ibid., xi, p. 58; xiv, p. 704] on stone fruits, but differs in that necrosis of the floral organs usually becomes apparent only after the setting of the fruit. From the dead blossoms, which remain attached for a long time, the fungus gains the twigs, many of which are killed, with consequent defoliation of the trees. In 1933 the outbreak resulted in almost complete loss of crop from the attacked trees, and in 1934 the twigs of the latter were found to bear numerous cankers around the dead fruit spurs of the preceding season. The blossom blight again recurred very severely in the spring of 1935, when infection occurred also on Landsberg Pippin apple trees.

Riker (A. J.). **Recent developments in control of graft knots on nursery Apple trees.**—*J. econ. Ent.*, xxix, 5, pp. 956–960, 5 figs., 1936.

Complete commercial control of graft knots on nursery apples, associated with (*a*) excess callus caused by a wound developing into a wound overgrowth, (*b*) crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*), and (*c*) hairy root (*P.* [*Bact.*] *rhizogenes*) [*R.A.M.*, xv, p. 774], is stated to have been obtained in the middle-western United States by the following precautions: (1) removal of bacteria on the surface of seedling grafts by washing off the soil and then dipping for one minute in mercuric chloride 1 in 1,000; (2) preparation of well-fitted grafts from clean roots with a dry surface to reduce the spread of bacteria over the cut; (3) use of nurseryman's adhesive tape wrappers [ibid., xiv, p. 452] which prevented excess callus and protected the grafts from insect attack but decayed before girdling the growing tree; and (4) selection of relatively insect-free sites for planting.

Ferraris (T.). **Seccume fogliare estivo del Pero.** [Summer withering of Pear leaves.]—*Riv. agric., Roma*, xxxii, 740, p. 287, 1936.

In 1936, pears in Italy became very severely infected by white leaf spot (*Sphaerella* [*Mycosphaerella*] *sentina*) [*R.A.M.*, xv, p. 103]. The disease broke out at the end of June, and by the middle of August some of the trees were completely defoliated. High resistance was shown by the Trionfo di Jodoigne variety and to a less extent by Curato, Pentecoste, Bergamotta Esperen, Martina, Cannellino, and Madernassa, while Verde Londra, Beurrè d'estate and Duchesse Williams pears were more susceptible. Control consists in treatment during the first fortnight in June and again about the middle of August with 1 per cent. Bordeaux mixture, Caffaro powder, or the new copper fungicide cuprital (Casa Scida, Torino). All fallen leaves should be burnt. Winter treatments with cupric sprays or polysulphides are also advantageous.

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. II. Monochaetia und Pestalotia und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. II. *Monochaetia* and *Pestalotia*, and their relationship to fruit-rotting.]—*Z. PflKrankh.*, xlvi, 9, pp. 401–411, 7 figs., 1936.

In continuation of this series of studies [*R.A.M.*, xvi, p. 105], the authors give brief descriptions of the following fungi, with annotations: *Monochaetia desmazierii*, *Pestalotia* [*Pestalozzia*] *truncata* Lev., *P. sydowiana* Bres., *P. palmarum* [ibid., xiv, p. 608; xv, p. 15], *P. cruenta* Syd., *P. disseminata* Thümen, and *P. theobromae* Petch, all of which were isolated by them from home-grown or imported plant hosts. It was experimentally shown that, except *M. desmazierii*, all the fungi studied were capable of causing a comparatively slow rotting of apples, which completely involved the whole fruit in periods from $1\frac{1}{2}$ to 3 months at room temperatures.

Gaddis (B. M.). **Eradication of Citrus canker and control of phony Peach and Peach mosaic: progress report.**—*J. econ. Ent.*, xxix, 5, pp. 940–944, 1936.

Citrus canker [*Pseudomonas citri*: *R.A.M.*, xv, p. 832] is stated to have been found during the last 18 months in non-commercial citrus areas in three Louisiana parishes and four Texas counties. Since August, 1935, relief labourers have eradicated over 1,500,000 trees, including all citrus, on more than 98 per cent. of the affected properties throughout the area under observation.

By means of intensive measures in the south-eastern States, the number of phony peaches [ibid., xv, p. 832] in the worst situations has been reduced from 177 per thousand in 1929 to less than 20 per thousand during the last two seasons. During 1936 over 2,000,000 abandoned and 3,500,000 escaped peach trees have been eradicated in 129 counties of 11 States by a force of 2,000 men employed under the Emergency Relief project, which has allotted $840,000 for the purpose.

Peach mosaic [ibid., xv, p. 816] has spread with extreme rapidity in Mesa County, Colorado; in 1934 E. W. Bodine counted about 3,000 diseased trees in the Palisade area, from which in 1935 some 30,000 were removed. In one orchard the number of infected trees increased from 2 in 1929 to all but 13 out of over 1,200 in 1935.

Newton (W.). **The menace of Cherry mosaic.**—*Bett. Fruit*, xxxi, 3, pp. 7, 14, 2 figs., 1936.

In the autumn of 1935, buds from a Royal Ann cherry tree growing in an experimental orchard on Vancouver Island and affected with mosaic [cf. *R.A.M.*, xv, pp. 480, 664] were transferred to a healthy cherry seedling in a neighbouring orchard. The following spring, every branch in which a bud had been inserted was diseased. There was a conspicuous loss of flavour in the fruit, which contained about 2 per cent. less sugar than normal cherries. In experiments in 1936 healthy trees inoculated by budding showed mottling of the leaves on the tips of the branches (the first symptoms to appear) within one month, even when the buds were inserted near the trunk. When the juice from mottled leaves was rubbed on healthy ones characteristic mottling appeared on the latter and on adjacent leaves within one month. Infection spread rapidly within trees artificially inoculated at a single point. Sufficient sap can adhere to pruning shears to transfer the disease from tree to tree, and when the disease is present implements should be sterilized after use on every tree.

Zeller (S. M.). **Verticillium wilt on cane fruits.**—*Bull. Ore. agric. Exp. Sta.* 344, 25 pp., 5 figs., 1 graph, 1936.

In western Oregon wilt (*Verticillium albo-atrum*) [*R.A.M.*, viii, pp. 357, 732; x, p. 757] has been the primary factor responsible for the decline in the growing of black raspberries (*Rubus occidentalis*), and is the chief factor limiting the yields of this host to about one-third of what it is assumed they should be. In severe outbreaks, 50 per cent. of the plants or more have been infected. Infection usually occurs through the small roots, and is carried, among other hosts, by eggplant,

pigweed (*Amaranthus* sp.), groundsel (*Senecio vulgaris*), maples [*Acer* spp.], and barberry.

Inoculation experiments were made on plantings of Cumberland, Munger, and Plum Farmer black raspberry varieties, with strains isolated from black raspberries and potatoes. Inoculation was effected at planting time by placing cultures in contact with the roots. Of the 1,877 plants inoculated, 1,624 or 86·5 per cent. became infected (as determined by cultures from discoloured wood), and of these 55·1, 31·1, 12·4, and 1·4 per cent. were infected in the first, second, third, and fourth years, respectively. Out of 262 uninoculated controls 137 or 52·3 per cent. became diseased, but infection was much delayed and two-thirds of it occurred in the third year. Of the infected plants 1·8 per cent. recovered. There were 37·3 per cent. of the inoculated plants and 10·3 per cent. of the controls killed by the disease. Out of a possible 723 plants only 274, or 37·9 per cent., attained four years of age. Of the inoculated plants 64·3 and 60·2 per cent. were infected by the fungus from black raspberry and potato, respectively.

Low temperatures and continuous cold weather seemed to increase mortality due to infection, infected plants apparently being more susceptible to winter injury than normal ones. A correlation appears to exist between the death of infected plants and temperatures below 20° F. With temperatures of under 10° marked increase occurred both in infections and deaths.

When the canes were planted 30 in. apart, 8·3 per cent. of the plants as far away as fourth from the inoculated plants became diseased in the third year. In the second year, 6·7 per cent. were infected at distances of 9 ft. with no intervening plants.

The Cuthbert variety of red raspberry was highly resistant, as were the blackberry varieties Evergreen (*R. laciniatus*), Himalaya, Lawton, and North-Western Trailing (*R. macropetalus*). Asiatic *Rubus* hybrids of the *Coreanus*, *Lasiostylus*, and *Triflorus* types, though infected, maintained extraordinary vigour and showed remarkable resistance. Considerable infection was observed in the red raspberry varieties Ranere, Chief, Herbert, Red Antwerp, Latham, Sunbeam, and Lloyd George.

In tests on viability the fungus lived over on raspberry canes in the soil from one autumn to the next (October, 1927, until October, 1928) but did not live much longer (after 25th February, 1929).

For purposes of control it is suggested that infected plants should be rogued provided that the incidence of the disease is under 5 per cent. Three- or four-year rotations with two or three non-susceptible crops also proved experimentally effective in eliminating the fungus from the soil and is recommended together with the use of planting stock from healthy nurseries.

Cooley (L. M.). **Retarded foliation in black Raspberries and its relation to mosaic.**—*Bull. N.Y. St. agric. Exp. Sta.* 675, 20 pp., 4 figs., 1936.

Four years' observations in western New York demonstrated that black raspberry plants [*Rubus occidentalis*] affected with green mottle mosaic [*R.A.M.*, xv, p. 377] show retarded foliage development on the

fruiting canes in spring. From 74 to 94 (average 85) per cent. diseased plants were detected by this symptom. In 1933 only 0·4 per cent. of the virus-free plants showed delayed foliation, but in 1934 winter injury considerably retarded development and accounted for the inclusion of 16 per cent. of virus-free plants in the retarded foliation class. In 1935 winter injury was again frequent but careful diagnosis of individual cases reduced the proportion of virus-free plants included in the retarded foliation group to 1·2 per cent. Retarded foliation was present in a higher proportion of the severe infections than of the medium ones, and in more of the latter than in mild cases. Inspections were more easily made and more reliable on susceptible varieties (e.g., Plum Farmer) than on resistant ones (e.g., Cumberland). The retarded foliation character is recommended as a basis for an auxiliary roguing early in the spring except in seasons where winter injury is abundant. On an average only 25 per cent. of black raspberries affected by yellow mosaic showed delayed foliation and neither virus affected red raspberries in this manner.

COOLEY (L. M.). **Wild Brambles in relation to spread of virus diseases in cultivated black Raspberries.**—*Bull. N.Y. St. agric. Exp. Sta.* 665, 15 pp., 4 figs., 1936.

Five years' field studies in large experimental black raspberry (*Rubus occidentalis*) plantations in western New York demonstrated that wild red raspberries (*R. idaeus*, principally var. *strigosus*), which are widely present, are usually infected with either green or yellow mosaic or both [see preceding abstract], though without marked symptoms, and support steady populations of the principal vector, *Amphorophora rubi*. Control by inspection and roguing was impossible without the eradication of the wild red raspberries in the vicinity of the experimental plots. In one instance, mosaic spread in significant quantity from wild red raspberries into a field 1,235 ft. away. Wild blackberries (mostly *R. allegheniensis*) and black raspberries (*R. occidentalis*) were rarely infected by mosaic and appeared to play no part in spread. In any mosaic control project in New York all wild red raspberries within 1,000 ft. of every planting should be eradicated.

Leaf curl [*R.A.M.*, x, pp. 195, 530; xv, p. 376] was rarely present on wild brambles, and was found in only four instances on red and black raspberries. The vector, *Aphis rubicola*, is common on all wild raspberries locally, and though spread of the disease from wild hosts to the experimental plantings was very slow, it took place as readily from distant as from closely adjacent sources. All affected wild raspberries should be removed from the vicinity of healthy plantings.

Wild blackberries and black raspberries were occasionally found to be affected by streak [ibid., xv, p. 163]. Spread from these usually appeared to be unimportant, but in one instance the presence of wild blackberries in the vicinity seemed to accelerate greatly the spread of the disease in black raspberries. It is thought probable that the blackberries harboured the unknown vector of streak disease. Any wild blackberries near black raspberry plantings containing severe streak infections should therefore be eradicated.

Cooley (L. M.). **Wild Bramble eradication.**—*Bull. N.Y. St. agric. Exp. Sta.* 674, 31 pp., 9 figs., 1936.

Notes are given on the eradication of wild *Rubus* spp. against virus diseases [see preceding abstract] by mowing, burning, grubbing, clean cultivation, live-stock grazing, and certain chemicals. Among the more effective eradicants were ammonium sulphocyanate, sodium chlorate, and sodium arsenite, and recommendations, based on experimental data, are made as to their correct application.

Hoette (Shirley). **Pitting disease of Bananas in Australia.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 90–95, 1 pl., 1 fig., 1936.

From Queensland bananas affected by pitting disease the writer isolated a fungus corresponding in the main with *Piricularia grisea*, the agent of the same disorder in Brazil and Trinidad [*R.A.M.*, xiii, p. 455], although the conidial dimensions of the Australian fungus (17 to 34 by 6 to 10 μ, average 23 by 8 μ) fall between those recorded by Saccardo (18 by 9 μ) and Wardlaw and McGuire (24 to 29 by 10 to 12 μ). Infection occurs during the colder months and may first be recognized by the development of pin-point brown spots, each surrounded by a narrow, water-soaked area, scattered over the entire concave surface of the finger and over the stalk of the green fruit, and expanding to a diameter of 2 to 4 mm. Under Queensland conditions *P. grisea* develops in the plantation before picking, whereas in Brazil and Trinidad the lesions do not begin to develop until the fruit is placed in cold storage. The disease is probably perpetuated by the washing down of the conidia by rain from the 'transition' leaves and bracts on to the fruit.

Smart (H. P.). **Sigatoka leaf disease of Bananas (Cercospora leaf-spot).** —*Leafl. Dep. Agric. B. Honduras*, 3, 7 pp., [1936].

A popular account is given of the banana leaf-spot (*Cercospora musae*) [see above, p. 156], with special reference to conditions in British Honduras, where infection has appeared in the Toledo District. Immediate action is being taken to apply control measures, but large-scale operations are regarded as impracticable as most of the plantations are small and scattered, and the planters have insufficient capital for the purchase of the power spraying or dusting appliances required. Hand spraying, however, is recommended, as giving some control, if infection is not too severe. In light outbreaks pruning off infected leaves and spraying the surrounding plants are advised; in bad but localized outbreaks all plants should be cut down over an area five times the extent of the infected zone.

Parham (B. E. V.). **Banana disease investigations—annual report, 1935.**—*Annu. Bull. Dep. Agric. Fiji*, pp. 28–31, 1936.

Bunchy top was found to be responsible for the destruction of some 10 per cent. of all banana plantings [*R.A.M.*, xiv, p. 45]. Young Veimama plants seldom survive early attacks, the stool failing to reach the fruiting stage; those of the Cavendish variety are more persistent, but the bunch, when thrown, is apt to be distorted and useless. A marked increase in the incidence of this disease was observed during 1935.

A motile bacillus was isolated from the vascular tissues of numerous wilted banana plants.

Corticium sp. was found causing a thread blight of coffee involving the leaves, shoots, and fruit, and both tobacco and tomato were severely damaged by bacterial wilt [*Bacterium solanacearum*] in the field.

BLATTNÝ (C.). **Nove adhaesivum k tekutým prostředkům na ochranu rostlin.** [A new adhesive for liquids used in plant protection work.]—*Ann. Acad. tchécoslov. Agric.*, xi, 4, pp. 372–374, 1936. [German summary.]

An account is given of preliminary experiments on various plants with a new alkaline liquid glue adhesive prepared by the Chemical Works, Kolin a.E. The results showed that at 0·25 per cent. strength, the preparation improved the spreading and adhesive properties of Bordeaux mixture and lime-sulphur, especially on plants with glabrous and shiny leaf surfaces, minimized the danger of leaf scorchings [see above, p. 189], and did not interfere with the toxicity of the fungicides. When added to 1 and 2 per cent. Bordeaux mixtures the glue retarded sedimentation at first, but increased its rate later on; the supernatant liquid was tinged slightly purplish, owing to the formation of an organic copper compound. Lime-sulphur solutions were emulsified by the glue. Further work is necessary to determine the doses to be usefully employed with the various fungicides.

HEAL (R. E.), SCHMITT (J. B.), & GINSBURG (J. M.). **Studies of certain new wetting agents and their application with insecticides and fungicides.**—*J. econ. Ent.*, xxix, 4, pp. 714–722, 1936.

An account is given of the writers' studies at the New Jersey Agricultural Experiment Station on the practical application of the closely related neutral wetting agents, aresket, areskap, and aresklene (Rubber Service Laboratories Co.). All the preparations can be used either in the form of dry powder or as solutions of varying strength, and all were found to be compatible with hard water. For plants with waxy foliage, e.g., cabbage, dilutions of 1 : 800 of either areskap or aresket and 1 : 1,600 of aresklene are necessary to produce satisfactory wetting, whereas leaves with lower interfacial tensions, e.g., apple, bean [*Phaseolus vulgaris*], and chrysanthemum, can be thoroughly wetted with any of the three spreaders at concentrations of 1 : 1,600 to 1 : 2,000. None of the preparations injured any of the 24 kinds of plants treated at 1 : 800 or 1 : 400, but at 1 : 200 all damaged apples, while peaches and roses were adversely affected by aresket and areskap, respectively.

The mixing of one part of either aresket or areskap with 500 parts of 300-mesh sulphur in a mortar resulted in a water-wettable sulphur, the former being the more efficient of the two and giving fair results even at the rate of 1 : 800. When sulphur was sifted into aresket at rates of 8 or 16 lb. per 100 galls. of 1 : 1,600, 1 : 2,000, and 1 : 3,000 dilutions it rapidly submerged, but at 1 : 4,000 the sulphur was only incorporated with some difficulty. In spray mixtures aresket at 1 in 2,000 was preferable to a dilution of 1 in 3,000.

In field experiments aresket at the rate of 1 oz. per 100 galls. was

satisfactorily used to wet flowers of sulphur in the preparation of orchard sprays (by adding the sulphur before the spray was diluted to its final concentration), or as a spreader for a sulphur-lime-lead arsenate combination, the addition of colloidal clay (wyojel) [*R.A.M.*, xv, p. 666], however, being requisite for adhesive purposes in the latter case.

Taylor (G. G.). **Application of orchard-sprays. III. Spray nozzles.**—*N.Z. J. Agric.*, liii, 2, pp. 68–76, 4 figs., 5 graphs, 1936.

The results of experiments conducted in New Zealand since 1933 [cf. *R.A.M.*, xv, p. 517] showed that the angle of the spray cone (calculated from patterns sprayed on white paper) increased with increase in pressure up to approximately 100 lb. With further increase in pressure up to 300 lb. the angle, after remaining constant over a short range of pressures which varied with the nozzle type, tended to diminish. With increase in diameter of disk aperture from $\frac{3}{64}$ to $\frac{8}{64}$ in. the angle increased, the rate of increase becoming greater as the number or diameter of the openings in the whorl-plate decreased or the angle of the openings increased. As the diameter of the disk aperture was increased, the cone became more hollow and the band of spray wider, while the size of the droplets increased. An increase in disk thickness from $\frac{2}{64}$ to $\frac{4}{64}$ in. narrowed the angle of the cone and increased the size of the droplets, though a further increase to $\frac{6}{64}$ in. had no further effect. Increasing the diameter of the whorl-plate openings from $\frac{4}{64}$ to $\frac{12}{64}$ in. rapidly decreased the angle of the spray cone, the droplets becoming slightly larger and the band of spray wider. When the angle of the whorl-plate openings was increased from 22·5° to 45°, the angle of the spray cone also increased; further increase to 67·5° gave further increase in the angle of the cone, but not to the same extent. As the angle of the openings was increased the band of spray became narrower and the droplets slightly finer. Increase in the number of the openings from 2 to 4 decreased the angle of the cone, increase to 6 causing a further, but less pronounced, decrease; at the same time the band of spray became wider, the cone less hollow, and the droplets slightly larger. The use of a strainer slightly increased the angle of the cone and improved the evenness of distribution, but did not affect the width of the spray or the size of the droplets.

Farrar (M. D.). **The effect of petroleum oil sprays on insects and plants.**—*Bull. Ill. nat. Hist. Surv.*, xxi, 1, vi+32 pp., 1 pl., 17 figs., 4 graphs, 1936.

In these studies on insecticidal oil sprays it is stated that dormant oil emulsions can be used with sulphur fungicides in the dormant stage of tree development, but may cause serious injury if applied after the buds start to swell. Oil emulsions containing certain forms of copper (including Bordeaux mixture) are relatively safe on foliage, but the spray is of low insecticidal efficiency and difficult to store because of its corrosive action on metal. In fact there is no known material sufficiently toxic to fungi that can be added to an oil emulsion without interference with either the insecticidal efficiency of the emulsion or the toxicity of the fungicide. In laboratory experiments on codlin moth (*Carpocapsa pomonella*) larvae the addition of six types of fungicides to

pyrethrum white oil emulsions reduced their efficiency from an average of 87·8 to 66·6 per cent. Fungicides partially soluble in the oil-phase of the emulsion decreased efficiency less than did flocculent materials, such as flowers of sulphur or Bordeaux mixture.

GODBOUT (F.) & LAVALLÉE (E.). **The horticultural crop protection office : a new technical organization for the protection of vegetable crops.**—*Rep. Quebec Soc. Prot. Pl., 1934–1935*, xxvii, pp. 75–79, 1935. [Received January, 1937.]

The organization and methods of the newly established Horticultural Crop Protection Office, an offshoot of the Bureau of Plant Protection of the Ministry of Agriculture, Montreal, are based largely on those of the very successful orchard spray service. Growers are notified by post-card at opportune times for the application of control measures against pests and diseases of economic importance [tabulated lists of the incidence of which in 1934 are given], and field tests are made to demonstrate the efficacy of some of the recommendations proposed.

EDSON (H. A.), WOOD (JESSIE I.), & NANCE (NELLIE W.). **Estimates of crop losses from diseases in the United States in 1935.**—*Plant Dis. Reptr, Supp.* 94, pp. 43–75, 1936. [Mimeographed.]

The estimates here presented of the losses in cereal, potato and other vegetable, fruit, and miscellaneous crops due to fungal, bacterial, virus, and physiological diseases in the United States in 1935 have been computed on the usual lines [*R.A.M.*, xiv, p. 780].

SANBORN (J. R.). **Gums produced by fungi : industrial utilization.**—*Industr. Engng Chem.*, xxviii, 10, pp. 1189–1190, 1 fig., 1 graph, 1936.

The gelatinous clot produced by the *Oidium* close to *O.* [*Oospora*] *lactis* in paper mills [*R.A.M.*, xiii, p. 667] is considered to be capable of further commercial application. The gum suspension may, for example, through its gelatinizing action, materially enhance the utility of many fibrous structures, provide mucilaginous surfaces for finely divided coating materials, and bind sheets of widely varying types. The potential industrial utilization of a number of other fungi is briefly discussed.

PORTER (C. L.) & PORTER (J. N.). **A fungous contamination of shaving cream.**—*Proc. Ind. Acad. Sci.*, xlv (*1935*), p. 102, 1936.

A brown stain of shaving cream was shown by inoculation experiments on sterilized soap media to be due to an *Aspergillus* of the *ochraceus* group, with a thermal death point between 90° and 100° C.

TSCHUDY (R. H.). **The use of acetates as a means of removing air bubbles from lacto-phenol mounts of fungi.**—*Stain Tech.*, xi, 4, p. 167, 1936.

The addition of a drop of methyl or ethyl acetate to material of *Chaetomium* mounted in glycerine jelly or lactophenol prevented the adhesion of air bubbles to the setae and spores. All the perithecia were

wetted by the acetate, which rapidly evaporated and thus facilitated the dissection of the organs.

SAKAMURA (T.). **Ueber einige für die Kultur von Aspergillen notwendigen Schwermetalle und das Befreiungsverfahren der Nährlösung von ihren Spuren.** [On some heavy metals essential for the cultivation of *Aspergilli* and the mode of eliminating traces of them from the culture medium.]—*J. Fac. Sci. Hokkaido Univ.*, Ser. V, Bot., iv, 3, pp. 99–116, 2 graphs, 1936.

In order to ascertain the quantities of certain heavy metals such as zinc, iron, copper, and manganese, essential for the growth in culture of *Aspergillus* spp. (represented in these experiments by *A. niger*, *A. tamarii*, and *A. oryzae*) [see next abstract], all traces of these elements occurring naturally in the medium (based on Pfeffer's solution plus glucose) were first eliminated by a process of absorption with 0·25 to 2 per cent. calcium phosphate requiring two hours for completion. On such a purified medium *A. niger* made practically no growth but responded by increase in weight and changes in conidial colour and shape to the addition to 10^{-7} mol. each of iron, zinc, and copper, and 10^{-6} mol. of manganese.

YOSHIMURA (FUJI). **The action of copper and manganese upon the formation and colour of conidium of some species of Aspergillus.**—*J. Fac. Sci. Hokkaido Univ.*, Ser. V, Bot., iv, 3, pp. 117–139, 6 pl., 37 figs., 1936.

Using media purified by Sakamura's method [see preceding abstract], the author found that in many species of *Aspergillus* sporulation is promoted by the presence of copper, the action of which requires to be supplemented, however, by manganese, the absence of the latter resulting in spherical cell formation. Combined in their correct proportions these metals produce adequate sporulation and normal conidial heads. The minimum concentration of the first-named element necessary for the purpose is 10^{-6} mol.

HAWKER (LILIAN E.). **The effect of certain accessory growth substances on the sporulation of Melanospora destruens and of some other fungi.**—*Ann. Bot., Lond.*, l, 200, pp. 699–717, 1 pl., 1 graph, 1936.

A crude extract of lentils, previously shown by Buston and Pramanik (*Biochem. J.*, xxv, pp. 1656, 1671, 1931) to stimulate the growth of *Nematospora gossypii* [*R.A.M.*, xvi, p. 35], was found to promote sporulation in *Melanospora destruens* and a number of other fungi. In the previous experiments both *i*-inositol (the baryta precipitate of the active substance) and an inositol-free fraction (the filtrate) were observed to be essential to the growth of *N. gossypii*, but the former was not necessary in the case of *M. destruens* and some of the other organisms used in the writer's tests. Sporulation increased parallel with additional amounts of extract up to an optimum. Comparative studies of the effects of the active substances from lentils and from fungal products (liquids staled by *Botrytis cinerea* or *Fusarium fructigenum* [*F. lateritium*]) showed that the process of sporulation in *M. destruens*, *Sordaria fimicola*, *Rosellinia necatrix*, and *Zygorrhynchus moelleri* [ibid.,

xiv, p. 655], and that of growth in *N. gossypii* responded similarly to the extracts from both sources; the fungal principles, however, were less rich in inositol than was the lentil extract.

These experiments are considered to bear directly on mycological technique in so far as they indicate a method of increasing and accelerating spore production, and this aspect of the work is discussed at some length.

SMITH (ELIZABETH C.). **The effects of radiation on fungi.**—*ex* Biological Effects of Radiation, Vol. ii, pp. 889–918, New York & London, McGraw-Hill Book Company, Inc., 1936.

An attempt has been made to assemble and briefly interpret the scattered and extensive literature on the effects of light on fungi under the general headings of visible and ultra-violet radiation, X-rays, and rays emitted from radio-active substances. The papers included in the bibliography as bearing on various aspects of the subject number 197.

METLITZKY (L. V.) & SOBOLEVA (Mme V. P.). Изучение летального действия электрического поля высокой частоты на культуры грибов **Sclerotinia libertiana** и **Botrytis cinerea.** (Предварительное сообщение.) [Studies of the lethal action of the electrical high frequency field on cultures of *Sclerotinia libertiana* and *Botrytis cinerea*. (Preliminary report.)]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 32–36, 1936. [English summary.]

In the authors' experiments pure cultures of *Sclerotinia libertiana* [*S. sclerotiorum*] and *Botrytis cinerea* were killed after 20 seconds' exposure to a high-frequency current under the following technical conditions: filament tension 11 volts, anode tension 2,000 volts, current in the secondary circuit 10 amp., wave-length 5·6 m., diameter of the secondary circuit plate 12 cm. In carrot roots inoculated with *S. sclerotiorum* and subjected to the same irradiation, for periods up to 3 minutes, the fungus was still alive two or three days later.

DUFRÉNOY (J.). **Les problèmes physiologiques en pathologie végétale.** [Physiological problems in plant pathology.]—*Ann. agron., Paris*, N.S., vi, 1, pp. 65–98, 6 figs., 1936.

After an introduction dealing with problems of plant pathology considered from the points of view of agronomy and physiology the author discusses in detail with full documentation the question of cellular metabolism in relation to thermodynamic principles, modifications of metabolism, the physiology and pathology of respiration and the cellular constants P_H and R_H. Emphasis is laid on the need for statistical analysis of experimental results [*R.A.M.*, xv, p. 519].

DAS GUPTA (S. N.). **Saltation in fungi.**—*Lucknow Univ. Studies*, v, 83 pp., 1936.

In this booklet, based on a course of lectures delivered at Lucknow University in 1934–5, the author gives a concise account of the available facts on various aspects of saltation. The subject is treated under the main headings of (1) genetics, (2) types of saltation, (3) induced saltation, (4) difference between parents and saltants, and (5) saltation, bud-variation, and plant chimeras. A bibliography of 152 titles is appended.

BARIBEAU (B.). **Geographical distribution of bacterial blight of Potatoes in Quebec.**—*Rep. Quebec Soc. Prot. Pl., 1934–1935*, xxvii, pp. 80–83, 1 map, 1935. [Received January, 1937.]

Bacterial blight of potatoes, a destructive disease of obscure origin first observed in Quebec in 1931, was detected in 30 counties of the Province in 1934, when a survey revealed the presence of infection in 719 fields (43 per cent.) with an area of 1,100 acres; of these 14·2 per cent. were severely attacked. The disease reaches a climax in hot, dry weather, the leaves drooping on their stalks and the whole plant wilting in a relatively short time. Dead plants usually show from 20 to 45 per cent. of the tubers affected with a yellowish-white soft rot.

GRIEVE (B. J.). **On Bacterium solanacearum Smith as the causal agent of the brown rot disease of Potatoes in Victoria.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 79–85, 1 pl., 1936.

A description is given of the agent of a potato disease known as 'brown rot' or 'sore eye' in Victoria, the symptoms of which agree with those attributed to *Bacterium solanacearum* [*R.A.M.*, xvi, pp. 118]. There were found to be certain differences between the two organisms, the former, for instance, in contrast to *Bact. solanacearum*, ordinarily producing no water-soluble brown pigment on beef agar plates, forming a small quantity of acid from glucose, and (in the case of two isolations) making good growth in Uschinsky's solution. The Victoria potato organism was successfully inoculated into garden nasturtium (*Tropaeolum majus*), tomato, castor-oil plant [*Ricinus communis*], and black nightshade [*Solanum nigrum*], but failed to infect tobacco (another point of difference from *Bact. solanacearum*). As a result of these comparative studies the author concludes that the agent of potato brown rot in Victoria, and probably in other parts of the Commonwealth of Australia [ibid., viii, p. 804], is a distinct strain of *Bact. solanacearum.*

SUZUKI (H.). **Studies on bacteria in the interior of Rice seeds (1)–(2).**—*Bot. & Zool.*, iii, pp. 749–760, 1931–1937, 5 figs., 1935. [Japanese. Abs. in *Jap. J. Bot.*, viii, 3, pp. (80)–(81), 1936.]

Three different bacteria, herein designated *Bacillus* A, B, and C, were isolated from the interior of rice seeds procured from various districts of Japan, the first being consistently associated with material from Okayama, Ibaragi, and Hokkaido, the second from Ibaragi, and the third from Hokkaido. The morphological, cultural, and physiological characters of the organisms are fully described.

SUZUKI (H.). **Studies on the influence of some environmental factors on the susceptibility of the Rice plant to blast and Helminthosporium diseases and on the anatomical characters of the plant. II. Influence of differences in soil moisture and in the amount of nitrogenous fertilizer given. III. Influence of differences in soil moisture and in the amounts of fertilizers and silica given.**—*J. Coll. Agric. Tokyo*, xiii, pp. 277–331, 235–275, 2 pl., 1935. [Abs. in *Jap. J. Bot.*, viii, 3, pp. (79)–(80), 1936.]

The susceptibility of rice plants to *Piricularia oryzae* [see above, p. 154] in the author's inoculation experiments was found to be in

inverse proportion to the soil moisture and to the amount of silica supplied, and directly proportional to the quantity of fertilizers given [*R.A.M.*, xiv, p. 653]. Plants grown on flooded soil with unit quantity of fertilizers are more resistant to blast disease than those cultivated under arid conditions with only half the quantity of fertilizers, while those grown on flooded soil without silica are more resistant than those in dry situations with silica. The extent of infection in flooded soil with a unit quantity of nitrogenous fertilizers was higher than in the same soil dressed with only half a unit and lower than in dry soil with a similar half-ration of fertilizer. Susceptibility to *P. oryzae* was shown to be closely correlated with the thickness of the outer wall and the silicated external layer of the epidermal cells, the number of silicated epidermal cells, the size of the dumb-bell-shaped cells, and the number of silicated short cells.

FRANCO (R. M.). **La enfermedad del Arroz en el Valle del Cauca.** [The Rice disease in the Cauca Valley.]—*Agricultura, Bogota,* viii, 1, pp. 3–10, 1936.

Popular notes are given on the symptoms, mode of infection, and control by cultural measures and seed treatment of the rice diseases due to *Helminthosporium* [*Ophiobolus miyabeanus*: see above, p. 154] and *Piricularia oryzae* [see preceding abstract] in the Cauca Valley, Colombia. The Fortuna variety is the most susceptible to the former pathogen, Guayaquil showing a certain degree of resistance. Sporadic cases of infection by *Sclerotium oryzae* [*Leptosphaeria salvinii*: see above, p. 156] have also been observed.

FERRER (B. B.). **El problema de los cultivos de Arroz y Cacao en el Cauca.** [The problem of Rice and Cacao cultivation in the Cauca Valley.]—*Agricultura, Bogota,* viii, 2, pp. 90–91, 1936.

Popular notes are given on the symptoms, mode of infection, and control in the Cauca Valley, Colombia, of the *Sclerotium* and *Helminthosporium* diseases of rice [*Leptosphaeria salvinii* and *Ophiobolus miyabeanus*, respectively: see preceding abstract], and of the following fungi pathogenic to cacao: *Phytophthora* [*palmivora*: *R.A.M.*, xv, p. 705], *Diplodia* [*Botryodiplodia theobromae*: ibid., xv, pp. 16, 278], and *Rosellinia* [ibid., xiv, p. 87], of which the last-named can only be combated by preventive measures, such as the use of the resistant Pajarito variety, while the two former are amenable to improved cultural methods, supplemented by repeated applications of Bordeaux mixture at 10- to 15-day intervals.

Oidium leaf disease.—*Bull. Rubb. Res. Scheme, Ceylon,* 53, 23 pp., 1936.

In the foreword to this bulletin R. K. S. Murray states that the Rubber Research Board of Ceylon appointed a committee to inquire into the advisability of recommending the Government to declare *Oidium heveae* a notifiable disease under the Plant Pests Ordinance, in which case the prescribed treatment could be enforced. The report of the Committee comprises section two of this bulletin. The decision reached was against compulsory measures, which, it considered, would be economically impracticable and also unjustifiable on other grounds.

An experimental campaign of sulphur-dusting small estates and holdings was carried out, however, in 1936 (the report of which, by W. I. Pieris, together with a memorandum by Murray, forms section three of this bulletin) to determine the type and cost of organization required to treat small estates and holdings. A total area of 1,003 acres was dusted, 2 one-acre holdings with sulphur bombs [*R.A.M.*, xiv, p. 654], the rest with a 3-h.p. dusting machine. The bombs (¾, ½, and ¼ lb.) were suspended from long bamboos, ignited, and held near the group of trees to be dusted, so that on explosion the wind carried the cloud of sulphur on to the trees. Sufficient bombs were used to give the amount of sulphur required for an ordinary dusting. On the whole, the bombs did not give very satisfactory results but may prove to be useful on small groups of early or late wintering trees, or for dusting inaccessible and very small holdings. Generally, the results of the dusting were beneficial, in some cases strikingly so. A total of 17 tons 10 cwt. 48 lb. sulphur was used, the cost of the treatment, including all charges, working out at the equivalent of about 10 rupees per acre. The small holder occupying less than 10 acres was unwilling to contribute anything to the cost of treatment, while the response of owners of small estates (10 to 30 acres) was disappointing.

Summing up in the final memorandum, Murray states that the work supports the conclusion reached by the Committee but suggests that the Rubber Research Scheme or the Department of Agriculture might usefully undertake to dust any small area whose owner gave notice that he desired and was prepared to pay for treatment.

[The report by W. I. Pieris also appears in *Quart. Circ. Ceylon Rubb. Res. Scheme*, xiii, 2–3, pp. 71–80, 1936.]

CASTELLANI (E.). **Action de quelques formes microbiennes en culture pure sur l'absorption polaire du sol.** [The action of certain micro-organisms in pure culture on the polar absorption of the soil.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 10, pp. 197–201, 1936.

In preliminary investigations lasting from May, 1935, to June, 1936, on the modifications occurring in the colloidal complex of soil, the author inoculated argillaceous-calcareous soil in large glass tubes with *Hansenula anomala*, *Rhizobium* [*Bacillus*] *radicicola*, *Bacterium* [*B.*] *subtilis*, *Bact.* [*B.*] *coli*, *Bact.* [*B.*] *fluorescens liquefaciens*, *Sarcina lutea*, *Fusarium herbarum* [*F. avenaceum*], and *Macrosporium* [*Pleospora*] *herbarum*, the bacteria and yeasts by means of 10 c.c. bouillon cultures and the two fungi with cultures on wheat extract. Ordinary bouillon was added to the tubes containing the two last-named fungi and to their controls, to all the other tubes water alone was added twice.

After two months the controls showed a reduction in soluble calcium of 0·33 milli-equivalents (from 1·24 to 0·91) per 100 gm. of dry soil, the corresponding figures for the inoculated tubes ranging from a decrease of about the same value in the case of *F. avenaceum* and *B. subtilis* to an increase of 0·4 m.-eq. in that of *S. lutea* and *B. radicicola*. The exchangeable calcium in the controls increased by 0.2 m.-eq. (from 15·65 to 15·85), the corresponding figures for tubes inoculated with *P. herbarum*, *S. lutea*, *H. anomala*, *B. subtilis*, and *B. fluorescens liquefaciens* being 0·22, 0·18, 0·8, 1·1, and 2 m.-eq., respectively. *B. radicicola*,

B. coli, and *F. avenaceum* caused decreases of 0·24, 0·6, and 2·8 m.-eq., respectively.

After one year all the tubes showed reduction of soluble calcium owing to absorption by the colloid, as shown by increase in exchangeable calcium. This increase amounted to 0·54 m.-eq. in the controls, and in the inoculated tubes ranged from 0·59 m.-eq. in the case of *B. coli* to 2·19 m.-eq. in that of *B. radicicola*.

It is concluded that there are certain micro-organisms present in the soil which bring about an increase in the exchangeable calcium of the colloidal complex, while there are others that decrease it. These organisms do not all act equally rapidly, and produce different results with different energizers. Soil exhaustion, it is suggested, may result from modifications in the colloidal complex brought about by special micro-organisms, such modifications being harmful to a given crop.

ZUMSTEIN (R. B.). **A preliminary study of soil pasteurization.**—*Proc. Ind. Acad. Sci.*, xlv (*1935*), pp. 94–98, 1936.

A study was made of the thermal death points of potato dextrose agar cultures of the following fungi commonly found inhabiting Indiana soils: *Sclerotium rolfsii*, *Fusarium* [*bulbigenum*] var. *lycopersici*, *F.* [*solani* var.] *eumartii* [*R.A.M.*, xvi, p. 56], *Sclerotium delphinii* [ibid., xv, p. 99], *Pythium de Baryanum*, *Macrosporium* [*Alternaria*] *solani*, and *Botrytis cinerea*, the minimum lethal temperatures for which were 50° C. (10 minutes), 65° (10), 55° (15), 50° (10), 40° (10), 50° (5), and 55° (15), respectively. From these data it would appear that the temperature usually recommended for the sterilization of greenhouse soils [ibid., xv, p. 824] (82°) might be somewhat reduced, but further experiments with soil as a medium are required to verify this supposition.

NOVOGRUDSKI (D.). Использование микробов в борьбе с грибковыми заболеваниями культурных растений. [The use of micro-organisms in the control of fungal diseases of cultivated plants.]—*Bull. Acad. Sci. U.R.S.S., Biol. Sér., 1936*, 1, pp. 277–293, 1936. [English summary.]

After briefly referring to the importance of antagonism between soil-inhabiting micro-organisms and plant-pathogenic fungi as a factor in disease [see above, p. 150], the author describes two methods which have been devised in the U.S.S.R. for the isolation of bacteria lysogenic to fungi from soil samples and from the surface of diseased plants. The first consists in placing moist particles of the soil under investigation on the aerial mycelium of a vigorous culture of a given fungus and incubating the whole at 25° C. If an antagonistic organism is present, the mycelium soon begins to dissolve around the soil particles, and ultimately disappears entirely from the whole culture surface; transfers from the cleared lytic spots, preferably far away from the soil particle, to potato agar then give pure cultures of the antagonistic bacterium. The second method consists in placing small sections of the stem of a diseased plant on potato agar plates and incubating them at 25°. During the first few days the development of the usual fungi and bacteria is seen, but if lysogenic organisms are also present, their activity becomes apparent

by the lysis of the fungi, and they can be isolated in pure culture as above mentioned.

These methods were successful in the isolation of several strains of bacteria which caused the lysis of various species of *Fusarium*, *Colletotrichum*, and other plant pathogenic fungi. Pot experiments carried out with strains antagonistic to *F. graminearum* [*Gibberella saubinetii*] and *F. lini*, showed that inoculation of sterilized soil with the corresponding bacterium 24 hours before the introduction of *G. saubinetii* completely protected wheat seedlings from infection by this fungus, whereas all the control plants were killed off, while inoculation of unsterilized flax-sick soil with the other bacterial strain reduced the infection of flax seedlings with *F. lini* from 26·6 per cent. in the control to 9·5 per cent.

Bell (A. F.). **Report of the Division of Entomology and Pathology.**— *Rep. Bur. Sug. Exp. Stas Qd, 1935*, pp. 19–27, 1 graph, 1936.

Reviewing the progress of the campaign for the eradication of sugar-cane gumming disease [*Bacterium vasculorum*: *R.A.M.*, xv, p. 320; xvi, p. 126] in southern Queensland, the author points out that in 1929, when the disease reached its climax, an intensive survey of the Bundaberg district revealed fewer than 50 disease-free farms. During the period from 1924 to 1929 the yield of cane in the locality fell from 16·5 to 12·5 tons per acre. Resistant varieties were introduced, and it is estimated that in 1936, P.O.J. 213, Co. 290, P.O.J. 2878, and P.O.J. 234 will form, respectively, 30, 25, 25, and 10 per cent. of the planting, of which 94 to 95 per cent. will consist of highly resistant varieties. A survey in the quarantine area at Mulgrave in March–April, 1936, showed the disease to be present on two further farms and probably present on two others; the boundaries of the area were accordingly extended. The disease was ascertained to be readily transmissible to maize, particularly the Fitzroy variety, by hypodermic infection, and *Bact. vasculorum* was reisolated from the infected plants. In another trial seeds of several maize varieties were interplanted with inoculated S.J. 4 cane, and the disease was transmitted under natural conditions to Fitzroy maize, from which the causal organism was again reisolated.

Fiji disease [ibid., xvi, p. 125] remains of direct importance in the Maryborough district and of indirect importance in all other parts of southern Queensland where, although the disease may be present only in scattered localities, the new high-numbered P.O.J. canes are extremely susceptible.

In northern Queensland chlorotic streak [fourth disease: ibid., xv, p. 320] was very prevalent, especially in low-lying areas. The economic importance of the disease is unquestionably considerable and the local farmers are availing themselves widely of the supply of disease-free Badila canes offered by the Bureau of Sugar Experiment Stations at a reasonable price. In a comparative field trial of diseased (70 per cent. diseased setts) and healthy Badila cane, the former showed a loss of yield of 17·9 per cent. In a second trial with the same variety in another locality the plants used were 100 per cent. diseased, but one-half of the material was submitted to the hot-water treatment. The total yield from the treated plots (two crops) amounted to 58·56 tons per acre, as against 41·9 tons for the untreated. Although no symptoms were seen

in the plant crop, the ratoon crop rapidly became completely infected, but in spite of this the more vigorous stand resulting from the originally healthy stools gave an increased yield of 6·94 tons per acre.

In a varietal resistance trial of new seedlings for resistance to red stripe [*Bact. rubrilineans*: ibid., xvi, p. 127] the percentage of deaths ranged from 34·7 to 11·5 (average 24·4) in the 15 hybrids tested, as against 34·4 for Badila.

Sun scald was prevalent in southern Queensland, while in the north the harmless but conspicuous banded sclerotial disease [*Sclerotium* sp.: ibid., xi, p. 432] was a concomitant of the prolonged wet season.

Pineapple disease [*Ceratostomella paradoxa*: ibid., xv, p. 558] was more prevalent than usual in late autumn and winter plantings, one 60-acre planting on the Lower Burdekin failing almost entirely. The disease invariably appeared to depend largely on unfavourable planting conditions.

EDGERTON (C. W.) & TIMS (E. C.). **Testing Canes for disease resistance in Louisiana.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 494–497, 1936.

Since sugar-cane does not produce viable seed in Louisiana most of the crossing is done at Canal Point, Florida, and the seedlings sent to Louisiana for testing. The methods adopted for tests against stubble deterioration [*R.A.M.*, xiv, p. 469], red rot [*Colletotrichum falcatum*], and mosaic are discussed in detail [ibid., xvi, p. 62].

RANDS (R. D.), ABBOTT (E. V.), & SUMMERS (E. M.). **Disease resistance tests on Sugar-cane seedlings and initial selection procedure in the southern United States.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 484–492, 1936.

In sugar-cane breeding work carried out in the United States [see preceding abstract] seedling tests for resistance to eye spot (*Helminthosporium sacchari*) [*R.A.M.*, xvi, p. 127], brown stripe (*H. stenospilum*) [loc. cit.], and *Cercospora longipes* [ibid., xv, p. 607] are carried out in Florida, to red stripe (*Phytomonas* [*Bacterium*] *rubrilineans*) in Georgia, and to the major diseases mosaic, red rot (*Colletotrichum falcatum*), and root rot (chiefly *Pythium arrhenomanes*) in Louisiana. Two types of tests are conducted: (*a*) those of a qualitative nature, e.g., leaf spot comparisons and nursery records, and (*b*) those of a quantitative nature to determine the effect of a disease on yields. The authors discuss only the former in this paper, in relation to seedling eliminations and further breeding work. Details are given of the procedure followed in tests for resistance to mosaic, red rot [ibid., xvi, p. 62], root rot, and other diseases. Root rot susceptibility is estimated roughly by comparison with the known reaction of control varieties interspersed throughout the plants. The estimates are complicated by varying degrees of virulence of the strains of *P. arrhenomanes* and its uneven distribution, and the test nurseries are artificially inoculated during a rainy period with a mixture of the most virulent strains. Accurate comparisons of varietal resistance are usually limited to greenhouse tests. Field tests of resistance to sheath

rot (*Cytospora sacchari*), red stripe (*Phytomonas rubrilineans*), and pokkah-boeng (*Fusarium*) [*Gibberella moniliformis*: ibid., xii, p. 679] are also based on visual estimates with sometimes counts of sucker suppression, or top-rotting (for the two last-named).

Preliminary results of studies conducted during the last four years denote that incomplete dominance of resistance to mosaic is indicated by five primary crosses between susceptible noble varieties and various collections of the immune *Saccharum spontaneum*. Mosaic susceptibility appeared to be increased as a result of back-crossing various resistant seedlings with the susceptible Co. 281 parent. Tests on 705 seedlings showed that resistance or susceptibility to either mosaic or red rot was independent of the reaction of the same seedlings to the other disease.

VERPLANCKE (G.) & VANDERBROECKE (R.). **Contribution à la flore mycologique belge.** [A contribution to the Belgian mycological flora.]—*Bull. Soc. Bot. Belg.*, lxix, 1, pp. 69–95, 20 figs., 1936.

An annotated list is given of 191 parasitic and saprophytic fungi (mostly imperfect and including 48 species of *Phoma*) newly observed in Belgium. Twenty species are described as new.

CAMPAGNA (E.) & LACHANCE (R. O.). **Annotated list of the Ustilagines observed in Quebec.**—*Rep. Quebec. Soc. Prot. Pl., 1934–35*, xxvii, pp. 50–52, 1935. [Received January, 1937.]

Brief notes are given on 223 Ustilaginales collected in Quebec, mostly on cereals and grasses.

MALENÇON (G.). **Notulae mycologicae Maroccanae.** [Moroccan mycological notes.]—*Rev. Mycologie*, N.S., 1, 5, pp. 257–275, 2 pl., 1936.

Brief notes are given on new or interesting fungal records made by the author in Morocco, of which the following may be mentioned. *Puccinia graminis* occurred in the aecidial stage on *Berberis hispanica*; *Uromyces betae* was rare on beet; *U. caryophyllinus* was present on cultivated carnations; *U. appendiculatus* was widespread on beans, on which it sometimes causes severe leaf fall; *U. renovatus* [*R.A.M.*, xiii, p. 183] was very common in northern Morocco on *Lupinus angustifolius*, *L. luteus*, and *L. hirsutus*; *U. striatus* occurred on lucerne [ibid., xiii, p. 290]; *U. fabae* [ibid., xv, p. 529] was widely distributed on broad beans [*Vicia faba*], on which it inflicts severe damage in rainy seasons; and *U. ervi* (a new record for Morocco) caused heavy losses on lentils in several localities, the leaves, stems, and pods being covered with teleutosori. *Kuehneola* [*Cerotelium*] *fici* [ibid., xiv, p. 560] was very prevalent on *Ficus carica* throughout the coastal regions, and *C. fici* var. *abyssinica* was newly recorded on *F. retusa* in the streets of Rabat. *Phragmidium subcorticium* occurred on cultivated roses, *Melampsora lini* [ibid., xvi, p. 41] on flax, and *M. allii-populina* [ibid., xv, p. 529] on *Populus nigra*. *Zaghouania phillyreae* [ibid., xv, p. 372] was frequent on *Phillyrea* sp., *Uredo* [*Melampsorella*] *ricini* [ibid., iv, p. 590] was observed, in the *Uredo* stage only, on *Ricinus communis*, and *U. quercus* on *Quercus suber*.

Bondartzeva-Monteverde (Mme V. N.), Gutner (L. S.), & Novosselova (Mme E. D.). Паразитные грибы оранжерей Ботанического Института Академии Наук СССР. [Parasitic fungi in the glasshouses of the Botanic Institute of the U.S.S.R. Academy of Sciences.]—*Acta Inst. Bot. Acad. Sci. U.R.S.S.*, Sér. II (*Pl. Cryptogamae*), *1936*, 3, pp. 715–802, 15 figs., 1936. [German summary.]

This is an annotated list of 229 species of parasitic fungi which were collected during the spring of 1933 in the temperate and hot-houses of the Botanic Gardens in Leningrad, including 73 species described as new to science, with Latin diagnoses. The majority consists of imperfect fungi (chiefly belonging to the genera *Colletotrichum*, *Gloeosporium*, *Phomopsis*, and *Phyllosticta*) causing various leaf spots, Ascomycetes being sparsely represented.

Ziling (M. K.). Грибы Дальневосточного края. [Fungi of the Far East.]—*Acta Inst. Bot. Acad. Sci. U.R.S.S.*, Sér. II (*Pl. Cryptogamae*), *1936*, 3, pp. 679–697, 1936. [German summary.]

This is a briefly annotated list of 202 species of fungi [including 26 new species for which Latin diagnoses are provided] collected by the author in 1928 in the Russian Far East on various plant hosts. The following may be mentioned. *Gnomoniella oharana* Nisikado & Matsumoto [cf. *Gnomonia oharana* Nisikado & Matsumoto, 1929: *R.A.M.*, ix, p. 72] on living leaves of *Ulmus parvifolia*, *U. pumila*, *U. laciniata*, and *U. japonica*. The Far Eastern fungus differs from the Japanese in the size of its ascospores and conidia, which measure 13 to 17 by 5 to 9 μ and 3 to 3·8 by 1·3 μ, respectively, instead of 10 to 26 by 3·6 to 6 μ and 1·6 to 2·6 μ. *Trametes persoonii* (Mont.) Lloyd on dying *Ulmus* sp. trees is not of considerable economic importance. *Stagonospora koraiensis* n.sp. on living needles of *Pinus koraiensis* forms numerous immersed, erumpent pycnidia 160 to 230 μ in diameter, with stylospores cylindrical in shape or tapering towards the apex, 3-septate, hyaline, and 30 to 50 by 3·8 to 5 μ. *Septoria convallariae-majalis* n.sp. on living leaves of *Convallaria majalis* forms amphigenous, linear or angular-ovate, sometimes confluent, dark green to olivaceous spots, with a purplish-brown margin. The pseudopycnidia are hypophyllous, rarely amphigenous, immersed, globose, brown, and 90 to 120 μ in diameter. The stylospores are straight or curved, 3- to 5-septate, and 48 to 57 by 1·3 to 1·5 μ. *S. physalidis* n.sp. was found on the living leaves of *Physalis alkekengi*, *S. ulmi* Ell. & Ev. on *Ulmus japonica*, and *Cercospora amurensis* n.sp. on living leaves of *Syringa amurensis*.

Deighton (F. C.). **XXXVIII. Preliminary list of fungi and diseases of plants in Sierra Leone. XXXIX. List of fungi collected in Sierra Leone.**—*Kew Bull.*, *1936*, 7, pp. 397–424; 424–433, 1936.

Both of these lists of fungi found in Sierra Leone consist almost entirely of records made by the author since 1926 and identified by the Imperial Mycological Institute, in collaboration with Miss Wakefield, Mr. Petch, and Dr. Chupp. In the first list the hosts are arranged in alphabetical sequence, and under the part of the host affected are given

the causal organism or disease, the locality and date of collection, and the collection number. The second list is really a fungus index of the first, with the addition of entomogenous and saprophytic fungi; the fungi are listed according to their systematic position and the genera of the host plants are indicated.

ROLDAN (E. F.). **New or noteworthy lower fungi of the Philippine Islands, I.**—*Philipp. J. Sci.*, lx, 2, pp. 119–123, 2 pl., 1936.

An annotated list is given of seven species of fungi, five of which are new to science and are furnished with Latin and English diagnoses, and the other two reported for the first time from the Philippine Islands. *Oenothera lamarckiana* petioles are attacked by *Cylindrocladium scoparium* [*R.A.M.*, x, p. 792], this being apparently a new host for the fungus. *Cercospora chrysanthemi* was found infecting *Chrysanthemum coronarium* foliage [ibid., xiv, p. 742]. Living leaves of *Pithecolobium dulce* bore irregularly circular, pale yellow lesions due to *Colletotrichum pithecolobii* n.sp., which is characterized by numerous black, non-septate setae with acute apices, 64 to 125 by 4 to 10·5 μ, and granular, falcate conidia, 14 to 28 by 3 to 7 μ. *Phoma rosaena* n.sp., the agent of a stem spot of roses, forms erumpent, subglobular, brownish, slightly papillate pycnidia, 75 to 240 μ in diameter, and elliptical to sub-cylindrical spores, 3·5 to 6 by 1·5 to 2·5 μ. Amphigenous, brownish lesions, 0·25 to 3 mm. in diameter, were produced on tomato foliage by *Helminthosporium lycopersici* n.sp., the hyphophyllous conidiophores of which, 70 to 145 by 7 to 9 μ, bear clavate, straight or slightly curved, 4- to 12-septate, olive-brown, conidia, 50 to 107 by 10 to 18 μ [but see *H. lycopersici* Maublanc & Roger: ibid., xv, p. 830]. The leaves of *Carthamus tinctorius* are subject to a spotting by *Phyllosticta carthami* n.sp., which sometimes involves the whole leaf. The pycnidia measure 63 to 133 μ, the ostiole 14 to 21 μ, and the oval or elliptical conidia 7 to 10 by 2 to 2·6 μ. *Pestalozzia homalomenae* n.sp. is recorded on *Homalomena philippinensis*.

BOSSCHIETER (J. C. A.). **Helopeltis en redrust in verband met werkmethoden.** [*Helopeltis* and red rust in relation to cultural operations.]—*Bergcultures*, x, 45, pp. 1415–1416, 1936.

One of the most effective means of eliminating *Helopeltis* and red rust [*Cephaleuros parasiticus*] infection from Java tea gardens [*R.A.M.*, xiii, p. 272] is the provision of ample leguminous shade in the form of *Albizzia*, dadap [*Erythrina hypaphorus*], *Deguelia*, lamtoro [*Leucaena glauca*], and the like, which should be regularly renewed. Another important precaution is the adoption of a conservative method of gathering the leaves, avoiding the so-called 'fine plucking' which puts an excessive strain on the bushes for the sake of securing a superior commercial product.

SMEE (C.). **Nyasaland Tea and pests and diseases.**—*Nyasald Tea Ass. quart. J.*, i, 2, pp. 1–5, 1936.

In connexion with some popular notes on the phytopathological aspects of tea-growing in Nyasaland, it is mentioned that *Armillaria*

mellea [*R.A.M.*, xv, p. 780] occurs in the soil at a depth considerably exceeding the 2-ft. limit reported from other countries. Increased attention is consequently being paid to the laborious and costly operation of stumping on recently cleared land, especially with a view to the elimination of *Afrormosia angolensis* and *Parinarium mobola* [ibid., xiv, p. 14].

Matzulevitch (B. P.). Дифференциация растительных вирусов серологическим методом. [Differentiation of plant viruses by the serological method.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 37–49, 1936. [English summary.]

After giving a cursory review of the work hitherto done in the identification of plant viruses by serological methods, the author outlines in some detail his own researches in this field. The tests were made with purified viruses of tobacco mosaic (Johnson's tobacco virus 1) [*R.A.M.*, xvi, p. 66 and next abstracts], tomato streak [ibid., xv, p. 614], and potato X virus [ibid., xvi, p. 116] (obtained from different artificially inoculated hosts and filter plants). The antigen of the first-named was prepared by precipitation with aluminium gel, the second by absorption with carbon and subsequent treatment with carbon dioxide, and the last by precipitation with kaolin; and the respective antisera were obtained by injecting these viruses intraveinously into rabbits. The results [which are tabulated] showed intensive precipitation of the antisera with their specific antigens, some fluctuations in intensity being, however, noted in the reaction of the antisera with the antigens derived from different hosts. Antigens of related viruses, e.g., potato mosaic (Up-to-Date) and potato streak (Great Scot), reacted similarly with mosaic antisera, and antigens of viruses present in a latent state in the host also gave reactions but of lesser intensity. No reactions could be obtained with antigens from healthy plants and antisera of non-related viruses. These results indicate the possibility of applying serological reactions to the identification of plant viruses.

Chester (K. S.). **Liberation of neutralized virus and antibody from antiserum-virus precipitates.**—*Phytopathology*, xxvi, 10, pp. 949–964, 2 figs., 1936.

Virus-immune serum, freed from the antibodies for healthy tobacco proteins [*R.A.M.*, xvi, p. 65 and next abstracts], was purified by the elimination of the protein fractions soluble in 30 and 43 per cent. saturated ammonium sulphate and of the pseudo-globulins rendered insoluble in water by heating to 57° C. The resultant water-clear fraction was found after dialysis to have undergone little or no loss of virus-antibody content, but showed only a minute proportion of the non-specific inhibitory action of unpurified serum. The inhibitory property of normal serum was found to be distributed among all the protein fractions of the serum.

Neutralized mixtures of tobacco mosaic virus juice and immune serum were prepared by titrating the serum with the juice until the supernatant liquid after centrifuging contained neither serum nor virus

in excess, as determined by precipitin tests. Neither free virus nor antibodies were recovered from such mixtures by various chemical, physical, and serological treatments, but the partial digestion of the mixtures with pepsin resulted in the destruction of the antibodies and the recovery of a large proportion of the virus. Supplementary evidence of the liberation of virus under these conditions was afforded in other experiments followed by infectivity tests. No infectious matter was obtained by the partial digestion of virus-free immune serum by pepsin, thereby proving that the virus antibodies are not merely virus particles modified by the serum proteins. These data are interpreted as demonstrating that, when tobacco mosaic virus is neutralized by its specific immune serum, it is not destroyed but held in an impotent, non-infective condition from which it may be liberated by the digestion of the antibodies by pepsin.

When neutral precipitates of potato virus X [ibid., xvi, p. 53] and its specified serum were acidified to P_H 4·8 or below, the precipitate underwent dissolution and large amounts of free antibody were recoverable in the supernatant fluids, denoting that the antibody survives the neutralization of this virus by its specific serum. Titration of the X virus with its immune serum showed that one unit of antibody is capable of combining with, and being saturated by, any number of units of antigen from 1 to 8.

Stanley (W. M.). **Chemical studies on the virus of Tobacco mosaic. VII. An improved method for the preparation of crystalline Tobacco mosaic virus protein.**—*J. biol. Chem.*, cxv, 3, pp. 673–678, 1936.

Details are given of an improved method for the preparation of crystalline tobacco mosaic virus protein [*R.A.M.*, xv, p. 611 and preceding and next abstracts] whereby the yield of the latter can be increased from 40 to 80 per cent. of the crude twice-precipitated globulin fraction.

In a representative experiment [which is fully described] 11 rapidly growing tobacco plants in 6-in. pots in a greenhouse were inoculated by rubbing the leaves with 2 c.c. of a solution of 2 mg. of crystalline tobacco mosaic virus protein in 0·1 M sodium phosphate at P_H 7 on 14th April, 1936, when the plants were 2 to 4 in. in height. Four weeks later they were cut, frozen, ground, and the pulp, weighing 1,360 gm., twice extracted with 0·1 M sodium phosphate at P_H 7. The two extracts were combined, 585 gm. ammonium sulphate added, and the precipitated globulin collected by means of gravity filtration. The virus activity of the filtrate and of the precipitate after this and subsequent treatments was determined by means of infectivity tests on *Nicotiana glutinosa*, using the half-leaf method. The preparations used for these tests were first dialysed against distilled water and then adjusted till they contained 0·1 M phosphate at P_H 7 before inoculation.

The filtered precipitate, consisting of 3·9 gm. protein, was dissolved in 500 c.c. 0·1 M phosphate solution at P_H 7 and filtered, through celite, washed with 100 c.c. of the phosphate and the protein in the 600 c.c. filtrate precipitated by the addition of 120 gm. ammonium sulphate. The precipitated protein was collected on filter paper and dissolved in 500 c.c. of the phosphate. To this solution, containing 3 gm. protein,

was added 40 gm. ammonium sulphate, and the slightly turbid solution was filtered through celite. In other experiments the amount of ammonium sulphate required to induce turbidity varied somewhat with the protein concentration of the solution, but was usually about 8 to 11 per cent. by weight. The celite filter cake was washed with 100 c.c. of 8 per cent. ammonium sulphate solution and the filtrate added to the main portion. The clear, brown filtrate, containing 2·6 gm. protein, was supplemented by 72 gm. ammonium sulphate to bring the ammonium sulphate concentration to 20 per cent. by weight, and the precipitated protein was removed by filtration through celite. Most of the active protein on the celite was removed by one extraction with 400 c.c. and two with 150 c.c. of the phosphate. The combined extracts, containing 2·5 gm. protein, were adjusted to P_H 4·5 by the addition of 6 c.c. of 3 M sulphuric acid and filtered through celite which retained all the virus activity. The celite filter cake was suspended in 300 c.c. water to make a 1 per cent. protein suspension and adjusted to P_H 8 by the addition of 7 c.c. of an aqueous suspension of 5 per cent. calcium oxide. The suspension was then filtered through celite, and the filter cake extracted three times with 150 c.c. water at P_H 8. On combining the four filtrates an almost colourless opalescent solution was produced, the protein of which was crystallized by successive additions of (1) 75 gm. solid ammonium sulphate, (2) 6 c.c. of a 5 per cent. glacial acetic acid solution in 0·5 saturated ammonium sulphate, and (3) 20 c.c. saturated ammonium sulphate solution. The yield of once-crystallized protein was 2·3 gm. or 77 per cent. based on the crude twice-precipitated globulin.

Eriksson-Quensel (Inga-Britta) & Svedberg (The). **Sedimentation and electrophoresis of the Tobacco-mosaic virus protein.**—*J. Amer. chem. Soc.*, lviii, 10, pp. 1863–1867, 8 graphs, 1936.

An ultracentrifugal and electrophoretic study was conducted at the Laboratory of Physical Chemistry, University of Upsala, Sweden, on Stanley's crystalline tobacco mosaic virus protein [see preceding abstracts].

Sedimentation velocity runs by the light absorption and the refractive index or scale method revealed a considerable lack of homogeneity in respect of molecular weight. From the scale runs distribution curves were calculated. The position of the maxima and the dispersion changes with the hydrogen-ion concentration; at P_H 6·8 some 65 per cent. of the material has a molecular weight ranging from 15 to 20 millions, assuming the dissymmetry constant to be the same as for other high molecular proteins. Possibly the virus protein may be homogeneous in its native state and undergo the above-mentioned changes as a result of the drastic modes of operation involved in the isolation process, especially with regard to deviations from neutrality in the hydrogen-ion concentration, to which it is highly sensitive. Sedimentation equilibrium runs indicate a mean molecular weight of the same order (17 millions). Electrophoretic determinations showed the virus protein to be chemically well defined and practically homogeneous. These data are interpreted as being definitely opposed to the bacterial theory of the nature of viruses [*R.A.M.*, xvi, p. 130].

Hollaender (A.) & Duggar (B. M.). **Irradiation of plant viruses and of microörganisms with monochromatic light. III. Resistance of the virus of typical Tobacco mosaic and Escherichia coli to radiation from λ 3000 to λ 2240 Å.**—*Proc. nat. Acad. Sci., Wash.*, xxii, 1, pp. 19–24, 3 graphs, 1936.

This is an expanded account of the writers' experiments on the inactivation of tobacco mosaic virus and *Escherichia* [*Bacillus*] *coli* by exposure to ultra-violet rays at relatively short wave-lengths, a summary of which has been noticed from another source [*R.A.M.*, xv, p. 403].

Holmes (F. O.). **Interspecific transfer of a gene governing type of response to Tobacco-mosaic infection.**—*Phytopathology*, xxvi, 10, pp. 1007–1014, 1936.

A necrotic type of response to infection by the tobacco mosaic virus was introduced into *Nicotiana paniculata* by transferring a dominant gene *N* (necrosis) from *N. rustica*, through repeated back-crosses of the hybrid *N. paniculata* × *N. rustica*, using *N. paniculata* pollen, but retaining in each generation only individuals reacting to inoculation by the production of necrotic lesions [cf. *R.A.M.*, xiv, p. 126]. The necrotic-type variety of *N. paniculata* thus developed was self-fertile and externally resembled the ordinary mottling type of the same species. In its response to infection, however, it was essentially similar to *N. rustica*, succumbing to systemic necrosis if infected in the juvenile stage and localizing the virus when inoculated at maturity.

A dominant gene *D* (unmodified necrosis), not detected in *N. rustica*, was observed in the newly derived necrotic-type *N. paniculata* plants and found to segregate independently with respect to the gene *N*. In the presence of the latter, *D* permitted the prompt appearance of necrotic primary lesions and prevented extensive chlorosis of the surrounding tissue.

Valleau (W. D.) & Johnson (E. M.). **Tobacco diseases.**—*Bull. Ky agric. Exp. Sta.* 362, 62 pp., 28 figs., 1936.

This bulletin is a revised edition of *Bull.* 328 published in 1932 [*R.A.M.*, xii, p. 117].

Morozoff (B. G.) & Zelenina (Mme I. N.). Болезни семян Табака—„плесневение". [Tobacco seed diseases: 'mouldiness'.]—*Pl. Prot. Leningr.*, *1936*, 10, p. 149, 1936.

The authors state that on the southern coast of the Crimea tobacco seed is often attacked by a greyish mould, which binds the seeds into clumps, and reduces their germinability by from 10 to 60 per cent. The condition is caused by a species of *Alternaria* differing somewhat in its morphology from *A. tenuis*. There was some evidence that infection of the seed may occur through the stigma of the tobacco flower, or may be carried to the seed cases by gnawing insects, before or after dehiscence.

MOROZOFF (B. G.), ZELENINA (Mme I. N.), & KOZMINA (Mme O. A.). Влияние болезней на вес и качество семян. [Effect of diseases on the weight and quality of seeds.]—*Pl. Prot. Leningr., 1936*, 10, pp. 148–149, 1936.

The authors state that preliminary determinations have shown that 90 per cent. of tobacco plants infected at an early stage by mosaic fail to produce any seed, the yield of the remaining 10 per cent. being less than 25 per cent. of the normal; later infections result in a smaller reduction of the yield of seed. It was further found that the yield of plants suffering from hollow stalk [*Bacillus aroideae*: *R.A.M.*, vii, p. 121; xv, p. 346] is reduced by 51 per cent., from powdery mildew [*Erysiphe cichoracearum*] by 15 per cent., and from ring spot [ibid., xv, p. 754] by 27 per cent. None of these diseases appeared to have any influence on the viability of the seed harvested.

GHIMPU (V.). **Bacteriozele Tutunului.** [Tobacco bacterioses.]—*Bul. Cultiv. Ferment. Tutun.*, xxv, 3, pp. 266–324, 28 figs., 1936.

This is a semi-popular account of tobacco bacterioses, their distribution, symptomatology, economic importance, host plants, and other points of interest in connexion therewith, supplemented by information on the characters of the causal organisms and on their control. The following pathogens are discussed: *Bacterium tabacum, Bact. angulatum, Bact. solanacearum, Bact. melleum* [*R.A.M.*, xiv, p. 659], *Bact. pseudozoogloeae* [ibid., xiv, pp. 473, 659], *Bact. heteroceum* [ibid., xvi, p. 85], *Bact. polycolor* [ibid., xiv, p. 16], *Bact. maculicola* [ibid., xiv, p. 658], *Bacillus aroideae* [see preceding abstract], *B. carotovorus* [ibid., xiv, p. 658], and *B. aeruginosus* [ibid., vii, p. 410].

DUFRÉNOY (J.) & SHAPOVALOV (M.). **Réactions histologiques et cytologiques des Tomates à l'infection par Aplanobacter michiganense E. F. Smith.** [The histological and cytological reactions of Tomatoes to infection by *Aplanobacter michiganense* E. F. Smith.]—*C.R. Soc. Biol., Paris*, cxxiii, 31, pp. 695–696, 1936.

The perivascular elements of French tomato plants attacked by *Aplanobacter michiganense* [*R.A.M.*, xvi, p. 113], separated from one another by dissociation of the middle lamella, were almost entirely occupied by the vacuolar solution, coloured yellowish-brown by phenolic compounds. The parenchyma cells at the periphery of a cavity in the internal phloem were in a state of active division and were intersected by bacterial zoogloeae; a tendency to the formation of a hyperplastic cicatricial layer was apparent. The cells of this reactional tissue rapidly form drops of a solution rich in phenolic compounds.

FISH (S.) & PUGSLEY (A. T.). **Bacterial canker of Tomatoes.**—*J. Dep. Agric. Vict.*, xxxiv, 10, pp. 520, 528, 1 fig., 1936.

A brief, popular account is given of the symptoms and control of tomato bacterial canker (*Phytomonas michiganensis*) [*Aplanobacter michiganense*], which, following its recent appearance in New South

Wales [*R.A.M.*, xiv, p. 610], has now been recorded in Victoria. For control the authors recommend the use of seed from healthy plants extracted by fermentation without the addition of water, the disinfection of seed of unknown origin with mercuric chloride ($\frac{1}{4}$ oz. in 5 galls.) for five minutes, the destruction of diseased material, and crop rotation.

BAMFORD (KATHERINE F.) & VAN REST (E. D.). **The relationship between chemical composition and mechanical strength in the wood of English Ash.**—*Bio-chem. J.*, xxx, 10, pp. 1849–1854, 1936.

Four out of six of the English ash (*Fraxinus excelsior*) trees from Norfolk examined in connexion with studies on the relationship between chemical composition and mechanical strength in the wood showed the heartwood discoloration commercially known as 'black heart'. The defect was found by statistical analyses to be independent of any irregularities in the relative proportions of the major components of the trees, being apparently associated rather with some constitutional peculiarity in the extractives. Support is lent to this view by the observation that an evaporated aqueous or alcoholic extract of 'black' heartwood emitted a strong phenolic odour absent from extracts of normal material.

VAN VLOTEN (H.). **Onderzoekingen over Armillaria mellea (Vahl) Quel.** [Investigations on *Armillaria mellea* (Vahl) Quel.]—*Fungus, Wageningen*, viii, 2, pp. 20–23, 4 figs., 1936.

Marked differences in the capacity for rhizomorph formation and corresponding virulence were observed in laboratory experiments at Wageningen with pure cultures of *Armillaria mellea* from a number of different hosts [*R.A.M.*, ix, p. 331; xiii, p. 553; xv, p. 232, *et passim*]. Thus, potato tubers inoculated with strains forming no rhizomorphs from horse-chestnut (*Aesculus hippocastanum*) and *Pinus sylvestris* [ibid., xiv, p. 803] remained healthy, those infected with the peach [ibid., vi, p. 237] and oak [ibid., vii, p. 290; xv, p. 63] strains producing sparse rhizomorphs became slightly diseased, while the poplar [ibid., vi, p. 586] and privet (*Ligustrum vulgare*) strains, especially the latter, forming a profusion of rhizomorphs, virulently attacked the tubers. There was, however, no sign of physiologic specialization within the fungus, the privet strain, for instance, being equally pathogenic to its own host, poplar, rose, and potato. Both on cherry agar and sterilized horse-chestnut wood the above-mentioned strains, as well as a number of additional isolations from Belgium, England, and France, displayed striking and apparently constant differences in cultural characters, including extent and colour of aerial mycelium, number of rhizomorphs, and capacity for fructification, the *P. sylvestris* strain, for instance, being the only one to form sporophores both in pure culture and in inoculation tests. In the case of potato tubers the rhizomorphs of the fungus may completely permeate the tissues. Trees take a considerable time (5 to 18 months in an experiment with oaks) to succumb to infection.

Tubeuf [C. v.]. **Tuberkulose, Krebs und Rindengrind der Eschen-(Fraxinus) Arten und die sie veranlassenden Bakterien, Nektriapilze und Borkenkäfer.** [Tuberculosis, canker, and cortical scab of Ash (*Fraxinus*) species and the responsible bacteria, *Nectria* spp., and bark beetles.]—*Z. PflKrankh.*, xlvi, 10, pp. 449–483, 31 figs., 1936.

The writer summarizes the work of previous investigators on the etiology of the so-called 'tuberculosis' of ash (*Fraxinus excelsior*), attributed by Nellie A. Brown to *Bacterium* [*Pseudomonas*] *savastanoi* var. *fraxini* [*R.A.M.*, xi, p. 683], and describes his own observations on the disease in Germany. He considers that the organism lives in cavities in the parenchyma and forms flat thickenings on the bark of the ash which develop into the 'bark roses' (flat, furrowed swellings). The *Nectria* (*ditissima* or *galligena*) [ibid., xiii, p. 732] cankers are characterized by smooth layers of suberized tissue which surround a wound penetrating to the wood. Frost cankers are similar but do not as a rule form annual layers of suberized tissue; they generally originate in the freezing of small shoots. Shallow cortical scab does not usually reach the cambium or wood, and the living bark tissues contain neither bacteria nor fungi. The short bark beetle (*Hylesinus fraxini*) is implicated in the disease, but the author considers that the beetles utilize the fissures made by the bacterium and fungus as channels of entry and thus establish a connexion between the rose or canker and scab syndrome.

Heavy damage from ash canker, sometimes involving extensive felling, is reported from the Kassel district, where trees up to five years old in both pure and mixed stands are liable to attack.

Tubeuf [C. v.]. **Die Ulmenkrankheit in München im Sommer 1936.** [The Elm disease in Munich in the summer of 1936.]—*Z. PflKrankh.* xlvi, 10, pp. 484–507, 22 figs., 1936.

The writer's observations on the entomological aspects of the elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in the Munich district of Germany [*R.A.M.*, xv, p. 479] are summarized, and the conclusion reached that the beetles chiefly involved in the transmission of infection are *Eccoptogaster* (*Scolytus*) *scolytus*, *E.* [*S.*] *multistriatus*, and *E.* [*S.*] *laevis*. No effective means of combating the fungus being known, it is suggested that an energetic campaign be adopted for the extermination of the insects.

Clinton (G. P.) & McCormick (Florence A.). **Dutch Elm disease—Graphium ulmi.**—*Bull. Conn. agric. Exp. Sta.* 389, pp. 701–752, 8 pl., 1936.

This exhaustive survey of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xvi, p. 142], made from a scientific rather than a practical standpoint, comprises a history of the disease in Europe, an account of its origin and spread in the United States [ibid., xv, p. 692 *et passim*], with special reference to Connecticut, and descriptions of the symptoms, the effect of the disease on the host, and the characters of the fungus. Information received from a number of European

scientists regarding the disease in their respective countries is appended together with a bibliography of 183 titles.

WORTHLEY (L. H.). **Progress in Dutch Elm disease eradication.**—*J. econ. Ent.*, xxix, 4, pp. 785–790, 1936.

Further details are given regarding the Dutch elm disease [*Ceratostomella ulmi*] situation in the United States [see preceding abstracts] as at 17th March, 1936. During the first four months of 1935, sanitation work was carried out in about one-third of the present infected zone, and during July, August, and September, about half the projected programme was completed. Over the entire area 80 per cent. as many diseased trees were found as in the two preceding years. At the end of the year 990,000 dead and dying trees had been removed and a further 465,000 labelled for future eradication.

OTTO (K. F.). **Zum Ahornsterben in der Baumschule.** [On the dying-off of Maples in the nursery.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 43, p. 516, 1936.

Acer platanoides and *A. pseudoplatanus* in German nurseries are stated to suffer severe damage from *Nectria cinnabarina* [*R.A.M.*, viii, p. 411], the fructifications of which, however, do not appear until the trees are dead. The early stages of the disease are characterized by wilting of the foliage and a discoloration of the wood, which is permeated by the hyphae of the fungus. Frequent inspections should be made and diseased trees eradicated and burnt.

YAMAMOTO (W.). **Woodrots of Taiwan (Formosa) I. Honeycomb heart rot of Persian Lilac.**—*J. Taihoku Soc. Agric. For.*, i, pp. 90–96, 1 pl., 5 figs., 1936. [Japanese.]

A fungus closely related to *Fomes senex* [*R.A.M.*, ii, pp. 142, 589] is stated to cause a honeycomb rot of the heartwood of Persian lilac (*Melia azedarach*) trees in Formosa. Cross sections through affected trunks show numerous white cavities, 2 to 5 by 2 to 7 mm., scattered along the annual ring of the heartwood. The fruiting bodies of the fungus are applanate, semicircular, sessile, often partially resupinate, sometimes imbricate, and measure 3 to 13 by 1·5 to 9 cm., the upper surface being brown or dark brown and sulcately zonate, and the under cinnamon to cinnamon-brown with diminutive pores. The context is corky, ochraceous-tawny, 1 to 3 mm. in thickness. The tubes are snuff-brown, often stratose, and measure 2 to 28 mm. in length. The cylindrical basidia, 16 to 20 by 3·6 to 4·3 μ, with 2 to 4 sterigmata, produce subglobose to elliptical, hyaline basidiospores, 3 to 5 by 3 to 3·5 μ. The conical, sharply pointed, straight or slightly curved, dark brown setae measure 19 to 34 by 5 to 8 μ, and the hyaline, obclavate cystidia are 15 to 20 μ in length. The fungus grows on modified Czapek's, onion, apricot, potato dextrose, and French bean [*Phaseolus vulgaris*] agars, forming a hyaline to ochraceous mycelium which gradually turns yellowish- or rusty-brown.

DEMAREE (J. B.) & COLE (J. R.). **A disporous Gnomonia on Pecan.**—*Phytopathology*, xxvi, 10, pp. 1025–1029, 2 figs., 1936.

Since 1928 a leaf blight of pecan (*Hicoria* [*Carya*] *pecan*) originally

reported by Matz (*Rep. Fla agric. Exp. Sta. 1917*, p. 89 R, 1918) as due to a *Gnomonia* has frequently been observed in southern Georgia. The circular or elongated spots produced by the fungus are light brown or tan to nearly black (the exact shade varying with the abundance of perithecial production, which takes place in mid or late July), and attain a diameter of up to $\frac{3}{4}$ in.

The scattered, submerged, subglobose to flattened, submembranaceous, dark brown to black perithecia are furnished with long, protruding, black necks and measure 80 to 150 by 100 to 160 μ. The asci are cylindrical, irregular, thin-walled, and contain commonly 2, occasionally 1, more rarely 3 or 4 uniseptate, fusiform to cylindrical, hyaline, guttulate spores, 24 to 51 by 5 to 10·5 μ. No conidial stage has been observed. Normal perithecia, asci, and spores developed on a mixture of maize meal and potato agar in about 20 days at the optimum temperature of 24° to 26·5° C. The fungus is named *G. dispora* n.sp. [with a description in English only].

VERRALL (A. F.). **The dissemination of Septoria acicola and the effect of grass fires on it in Pine needles.**—*Phytopathology*, xxvi, 10, pp. 1021–1024, 1936.

Evidence accumulated in Louisiana in 1932 indicates that the spores of *Septoria acicola*, the agent of a serious needle blight of longleaf pine [*Pinus palustris*] seedlings [*R.A.M.*, xiv, p. 266], are disseminated to a slight extent by wind, but that the spread of the fungus is mostly effected locally by means of spores conveyed in raindrops spattering from diseased plants. Two or more warm, rainy days appear to be necessary for profuse spore discharge, ordinary summer showers being too brief to induce the process and the temperature during the winter rains normally too low to permit it. Cultures from needles killed by fire in 1933 yielded no living material of *S. acicola*, the place of which in the burnt tips is rapidly taken by *Pestalozzia*, *Lophodermium*, and other fungi.

HOLST (E. C.). **Zygosaccharomyces pini, a new species of yeast associated with bark beetles in Pines.**—*J. agric. Res.*, liii, 7, pp. 513–518, 1 pl., 1 fig., 1936.

A Latin diagnosis and an English technical description are given of a yeast, which cultural investigations during three years have shown to be generally associated with the pine bark beetles *Dendroctonus brevicornis*, *D. frontalis*, *D. valens*, *Ips oregoni*, *I. emarginatus*, *I. avulsus*, *I. grandicollis*, and *I. calligraphus* in wood affected with blue stain (*Ceratostomella*) [spp.: *R.A.M.*, xv, p. 544] in the United States. The fact that the organism produces hat-shaped ascospores after a sexual process, together with its property of only fermenting glucose, fructose, and mannose of the common sugars, lead the author to consider it as a hitherto undescribed species of *Zygosaccharomyces*, for which the name *Z. pini* n.sp. is suggested.

TUBEUF [C. v.]. **Einfluss der Städte auf Pflanzenkrankheiten.** [The influence of towns on plant diseases.]—*Z. PflKrankh.*, xlvi, 10, pp. 507–509, 1936.

The author considers there are two main reasons for the rarity of

Ribes infection by white pine blister rust [*Cronartium ribicola*: *R.A.M.*, xvi, p. 136] in urban districts: (1) the virtual disappearance of pines and other conifers from towns owing to smoke injury; and (2) the premature development of the leaves in the relatively mild climate of cities, enabling them to escape the critical period for infection.

COLLEY (R. H.) & AMADON (C. H.). **Relation of penetration and decay in creosoted Southern Pine poles.**—*Bell Syst. tech. J.*, xv, 3, pp. 363–379, 2 figs., 7 graphs, 1936.

Poor penetration of the non-durable sapwood has been found to constitute the primary factor in the decay of creosoted southern pine [*Pinus palustris*] poles [*R.A.M.*, xvi, p. 77], over 3,000 of which, treated with coal-tar creosotes of various types at 13 plants in the southern States, were critically inspected to determine the time and location of the inception of decay. The poles had been in line for periods of 5 to 26 years under divergent climatic conditions in scattered localities east of the Mississippi. Of the failures, 95 per cent. were poles in which the creosote had penetrated less than 1·8 in. or 60 per cent. of the sapwood thickness, while no serious deterioration was observed among those penetrated to a depth exceeding 2·1 in. or 75 per cent. of the total thickness of the wood. The current Bell System treating specifications require a penetration of 2·5 in. or 85 per cent. of sapwood thickness, whereby the risk of failure by decay during the ordinary service life of a line is stated to be reduced to a practical minimum.

YOUNG (H. E.). **The species of Diplodia affecting forest trees in Queensland.**—*Qd agric. J.*, xlvi, 3, pp. 310–327, 7 figs., 1 graph, 1936.

The planting of exotic species of *Pinus* in Queensland has been accompanied by the development of die-back caused by two distinct species of *Diplodia*. The first, originally recorded at Benarkin in August, 1930, on *P. radiata* and since at Imbil on the same host, has been found to be due to *D. pinea* [see above, p. 148]. The second disease was first found at Burwash in 1934 and so far has been confined to this locality. It is attributed to *D. natalensis* [*R.A.M.*, xiv, p. 729], which is common in the infected area on lemon trees. Inoculations of seedlings of *P. insularis*, *P. patula*, *P. taeda*, and *P. caribaea* in the greenhouse with pure cultures of *D. pinea* isolated from *P. radiata* gave rise to typical die-back, followed by death, as did similar inoculations of *P. taeda* and *P. caribaea* seedlings with *D. natalensis* isolated from *P. taeda*. Isolations of the latter species from lemon were also pathogenic to *P. taeda* and that from *P. taeda* to lemon fruits. Inoculations with both *D. pinea* and *D. natalensis* generally had less severe effects when the plants were placed in the open than when kept in humid greenhouse conditions.

The die-back caused by *D. pinea* appears in summer as a bronzing and finally a browning of the needles, usually of a leader or a terminal shoot of a lateral branch. The shoot wilts and dies, and the infection may spread down the tree and kill it. Infection often follows hail injury. In severe attacks there is a copious exudation of resin from cracks in the bark of the trunk, which is often greyish-white. The first symptoms of the condition caused by *D. natalensis* appears in early spring during warm, humid weather, the foliage in the affected parts

becoming bronzy-green, and dark, water-soaked areas being present on the needles. The old foliage suffers first. Not more than six weeks elapse between the appearance of the disease and the death of the tree. In the great majority of the cases infection begins on the side of the trees sheltered from the sun and the prevailing winds. *P. caribaea* showed indications of resistance.

Other species attacked in Queensland by *D. pinea* besides *P. radiata*, though to a less extent, are *P. pinaster*, *P. patula*, *P. taeda*, and *Cupressus sempervirens*, and the fungus has been isolated also from *P. radiata*, *P. longifolia*, *P. caribaea*, *P. coulteri*, and *P. pinaster* from New South Wales. The steps taken against *D. pinea* consisted in the removal of all diseased trees, and the discontinuation of planting *P. radiata* and *P. pinaster*. Against *D. natalensis* the control measures comprised pruning back all dead and dying wood on living trees and burning all the prunings. All trees that were unlikely to be saved in this way were removed and burnt. A careful watch was kept for fresh cases of die-back and these were treated as described. The prompt measures adopted against *D. natalensis* appear to have succeeded in clearing up the trouble.

The only other *Diplodia*-like fungus recorded as a coniferous parasite in Queensland is *Botryodiplodia theobromae* found on hoop pine (*Araucaria cunninghamii*) seed which had failed to germinate and on seedlings apparently killed by the fungus.

MILLER (J. A.) & ALDRICH (K. F.). **Pseudolarix amabilis, a new host for Dasyscypha willkommii.**—*Science*, N.S., lxxxiii, 2160, p. 499, 1936.

A search for the European larch (*Larix europaea*) canker fungus, *Dasyscypha willkommii* [see next abstract], throughout a 2½-mile radius from each of the two known centres of infection at Hamilton and Ipswich, Massachusetts, revealed the presence of closely similar symptoms on *Pseudolarix amabilis*, cultures from the inner bark of which were identified by G. G. Hahn as *D. willkommii*. This is stated to be the first record of the occurrence of European larch canker in the United States on a genus other than *Larix*.

HAHN (G. G.) & AYRES (T. T.). **The European Larch canker and its relation to certain other cankers of conifers in the United States.** —*J. For.*, xxxiv, 10, pp. 898–908, 4 figs., 1936.

Larch canker (*Dasyscypha willkommii*) [*R.A.M.*, xiii, p. 482; xv, p. 618], discovered in the United States in 1927 on *Larix europaea* imported from Great Britain, is confined to a small area in the vicinity of Hamilton and Ipswich, Massachusetts. The fungus infects only species of *Larix* and *Pseudolarix*, and contrary to European and American reports, does not attack the blue form [var. *glauca*] of Douglas fir (*Pseudotsuga taxifolia*) nor has it been observed on pine, fir, or spruce growing in the larch canker-infested area at Hamilton. Inoculation experiments were successful on *L. europaea*, *L. leptolepis*, *L. laricina*, *L. occidentalis*, and *L. dahurica*. A description is given of cankers related to the European larch disease found on the blue form of Douglas fir and *Pinus ponderosa* and associated with *D. ellisiana* [ibid., xiii,

p. 553], which is distributed generally as a saprophyte on conifers along the eastern seaboard of the United States. White pine canker of native five-needled pines closely resembles European larch canker, but is caused by *D. pini* [ibid., xiv, p. 266].

General spread of the European larch canker appears to have been checked by the prompt destruction of over 3,700 infected trees made in an attempt at complete eradication of the disease, but in 1935 new infections were found on European larch (55 trees) and one individual of *Pseudolarix amabilis* [see preceding abstract]. Steps have been taken to secure the destruction of these trees.

Refshauge (Lyly D.) & Proctor (Eunice M.). **The diagnosis of some wood-destroying Australian Basidiomycetes by their cultural characters.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 105–123, 3 pl., 1936.

With a view to facilitating the laboratory identification of certain Australian wood-destroying fungi, the authors carefully determined and here tabulate and describe the cultural and microscopic features of 14 such organisms on four different media, viz., malt agar, potato dextrose agar, Czapek's synthetic agar (modified), and Czapek's synthetic agar plus malachite green. The fungi thus investigated were *Stereum illudens, S. lobatum, S. vellereum, Fomes clelandi, F. hemitephrus, F. robustus* [*R.A.M.*, xiii, p. 664], *Ganoderma applanatum, Polyporus anthracophilus, P. arcularius, P. gilvus* [ibid., xv, p. 410], *P. rhipidium, Polystictus versicolor* [ibid., xvi, p. 139], *Trametes lilacino-gilva* [ibid., viii, p. 80], and *T. ochroleuca*. Certain fungi, e.g., *Polyporus arcularius*, produced fruiting bodies in culture much more readily than others. Evidence is briefly adduced to show that the decolorization of Czapek's synthetic agar plus malachite green by many of the organisms is a function of the living form and not the result of metabolic secretions. Four keys are compiled from the results obtained, three based on cultural characters, and one on microscopic features.

Bondartzeff (A. S.). К вопросу о нахождении и распространении **Polyporus destructor (Schrad.) Fr. ь СССР.** [On the occurrence and distribution of *Polyporus destructor* (Schrad.) Fr. in the U.S.S.R.]—*Acta Inst. bot. Acad. Sci. U.R.S.S.*, Ser. II (*Pl. Cryptogamae*), *1936*, 3, pp. 669–678, 4 figs., 1936. [German summary.]

In a cursory review of the relevant literature the author points out the diversity of conception among mycologists concerning the fungus known as *Polyporus destructor* [*R.A.M.*, xiii, pp. 137, 604], the first reliable diagnosis of which was given by Bourdot and Galzin (Hyménomycètes de France, pp. 546–547, 1927). The pileus is sessile, frequently narrowing at the base almost to a stipe, but not infrequently spreading with detached margins, and measures 0·5 to 1·5 cm. long, 1 to 3·5 cm. broad, and 0·3 to 0·6 cm. thick. The surface is white, slightly tomentose towards the margins, later becoming dirty white or faintly reddish-brown in places, especially towards the base, and the margins are slightly involuted, thin, and covered with a slight down. The tubes are short, but may attain up to 5 mm. in old pilei, forming a layer much thicker than the flesh; they are white at first, becoming creamy-brown; the

pores are rounded to irregular, and 3 to 4 per mm. The basidia are 12 to 15 by 5 to 6 μ in diameter, clavate, with 2 or 4 sterigmata. The spores are numerous, ellipsoidal, slightly bent, hyaline, and 4 to 5·5 (6) by 2·5 to 3 μ.

Notwithstanding prolonged searches in Leningrad, the author could find only two typical specimens of *P. destructor*, one in a hothouse and one in a cellar, and a further specimen was sent him from Kostroma, also from a cellar. He considers, in agreement with Lloyd, that the fungus is very rare in nature, and is strictly confined to processed timber. The numerous records of it which exist from Russia, as well as practically all the herbarium specimens in that country, are described as erroneous identifications.

A description is also given of *P. destructor* var. *resupinatus* Bourdot & Galzin, which Pilát (*Bull. Soc. Myc. Fr.*, xlviii, 1, p. 9, 1932) has separated as a distinct species, *Leptoporus resupinatus* (B. & G.). This fungus occurs on rotting coniferous wood in the forests, and has only been recorded three times in European Russia.

WHITEHEAD (T.). **Experiments on the use of lime in controlling finger and toe disease of Brassicae.**—*Welsh, J. Agric.*, xii, pp. 183–192, 1936.

In experiments on the control of club root of *Brassica* spp. [*Plasmodiophora brassicae*: *R.A.M.*, xv, p. 547] extending from 1933 to 1935 applications of lime were made on heavily contaminated soils at Pwllheli and Bangor, the former soil being a coarse sand of P_H 5·25, and the latter a clay of P_H 7·24.

It was found that the more alkaline soils averaged less disease than the acid ones, but at Bangor on soil of P_H 7·81 containing 0·41 per cent. exchangeable calcium oxide, 37 per cent. of the cabbages became badly infected. Cauliflowers growing in plots of P_H 7·85 showed 71·4 per cent. infection, as compared with 85·3 per cent. in plots at P_H 5·68. At Pwllheli heavy percentages of badly diseased plants, ranging from 100 per cent. in the case of cauliflowers to 90 and 60 per cent. for Brussels sprouts and cabbages, respectively, occurred in plots where the P_H values at planting and the end of the season were 7·45 and 7·77, respectively. It is, therefore, evident that a high P_H value of the soil does not in itself prevent infection. Increasing control was given, however, wherever control resulted, by increasing amounts of lime. The lime is considered to exert a directly lethal effect on the spores, and any residual effect of small dressings is due to cultivation assisting in the incorporation of the lime in the soil.

In experimental plots, cauliflowers were the most susceptible, followed by spring-sown cabbage, Savoy cabbage, and Brussels sprouts, whilst swedes, which are heavily infected under farm conditions, were lightly attacked. The author considers that this result may point to the existence of different physiologic strains of the fungus.

JAMALAINEN (E. A.). **Tutkimuksia möhöjuuresta (Plasmodiophora brassicae Wor.).** [Investigations on club root (*Plasmodiophora brassicae* Wor.).]—*Valt. Maatalousk. Julk.*, 85, 36 pp., 1 map, 1936. [German summary.]

Club root of crucifers (*Plasmodiophora brassicae*) is stated to occur

in a destructive form in Finland [*R.A.M.*, v, p. 190], more especially in the south, in densely populated regions, and in the vicinity of towns, white cabbage being attacked with particular severity.

Of the 88 wild or ornamental crucifers used in inoculation experiments with the fungus [cf. ibid., xiii, p. 2], 69 were susceptible, 29 of which do not appear to have been previously recorded as liable to club root, including *Alyssum campestre, Arabis bellidifolia, Biscutella laevigata, Braya alpina, Draba grandiflora, Erysimum rupestre, Hesperis tristis, Iberis odorata, Rapistrum perenne, Sisymbrium cumingianum,* and *Thlaspi violascens.* All the varieties of white, red, and Savoy cabbage grown in infested soil contracted 100 per cent. infection, and most kinds of cauliflower and kohlrabi sustained equally severe damage. A fair degree of resistance was shown by Hercules Brussels sprouts (30 per cent. infection), while most curly and fodder cabbage varieties included in the trials proved well able to withstand the attacks of the pathogen. On the other hand, turnips and swedes suffered extensive injury, even the most resistant of the former (Forssa) showing 85 per cent. infection and of the latter (Yellow Tankard) 83·3. Radishes were in general little affected by the disease, to which a particularly high degree of resistance was shown by Long Black Paris Winter, Delikatess, Dreienbrunnen, Rubin, and Saxa.

In experimental plots of 2 sq. m. each the best control of club root on Bangholm turnips and a Finnish swede variety was obtained by the sterilization of the soil, a fortnight prior to sowing, with 400 c.c. of 40 per cent. formalin per sq. m. [ibid., xii, p. 710], while fairly satisfactory results were also given by 0·1 per cent. mercuric chloride [ibid., xi, pp. 17, 686] and 0·25 per cent. uspulun [ibid., xii, pp. 233, 493], but not by slaked lime (2 kg. per sq. m.). The treatment of seedlings with various disinfectants at and after planting was ineffectual.

KALASHNIKOFF (K. J.). Влияние минеральных удобрений на задержку развития черной ножки Капусты в защищенном грунту. [Influence of mineral fertilizers on the development of black leg of Cabbage under glass.]—*Pl. Prot. Leningr., 1936,* 9, pp. 49–53, 1936. [English summary.]

The results of greenhouse experiments in Leningrad showed that seed-bed infection of cabbage seedlings with blackleg (*Moniliopsis aderholdi*) [*R.A.M.*, xv, p. 625] was reduced by from 22·4 to 28·5 per cent. as compared with controls, in beds that had received applications of either Chile saltpetre at the rate of 33 gm. per sq. m., ammonium sulphate (28 gm.), sylvinite (66 gm.), or superphosphate (44 gm.). The general health of the cabbage seedlings was also considerably improved by the fertilizers.

MCCUBBIN (W. A.). **Analysis of typical plant diseases from the quarantine standpoint.**—*Phytopathology*, xxvi, 10, pp. 991–1006, 1936.

An analysis [presented in tabular form] of 200 typical plant diseases from the quarantine standpoint [*R.A.M.*, xv, p. 688] indicates the type of quarantine action (embargo, detention, disinfection, inspection, and unrestricted entry) necessary in the case of seeds, other propagating material, and commercial produce of the chief host for the exclusion of

such diseases. The summarized results denote that embargo is scarcely needed for seeds and would be of minor use for other propagating material, but should be widely employed for commercial produce. Comparatively few seeds require detention, which should be freely used, however, for other propagating materials. Disinfection, the important procedure for seeds, is of only moderate use for other propagating materials and commercial produce, while inspection is of little value for all categories from the standpoint of exclusion. Unrestricted entry is permissible for many seeds but for very little other propagating material and for only a limited range of commercial produce. The last-named would appear to constitute the limiting factor in the attainment of an ideal exclusion system.

Memorandum on the Provisions of the Pharmacy and Poisons Act, 1933, affecting the purchase of Poisons for use in Agriculture and Horticulture.—*Home Office Memor. Poisons No. 4* (*Agric. & Hort.*), 11 pp., 1936.

This memorandum presents in summary form information as to the channels through which and the means by which persons engaged (*a*) as amateurs or (*b*) as professionals in agriculture and horticulture in Great Britain may lawfully obtain the poisons they require for their pursuit or business.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, July–September, 1936.—pp. 115–126, 1936.

Summaries are given of the plant quarantine import restrictions in force in Malta, Denmark, Irish Free State, Free City of Danzig, Mexico, and Switzerland, together with an explanatory note on the ten Federal domestic plant quarantines controlling the inter-State movement of plants and plant products within the United States.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, viii, 7, pp. 160–161, 177–178, 1936.

Prussia. Province of Schleswig-Holstein, administrative district of Schleswig. An Order dated 22nd June and valid from 5th July, 1936, to 31st March, 1946, provides for the regular inspection of Douglas firs (*Pseudotsuga douglasii*) [*P. taxifolia*] in nurseries and other horticultural establishments by the local plant protection authorities with a view to preventing the spread of diseases [especially *Rhabdocline pseudotsugae*: *R.A.M.*, xv, p. 832, and above, p. 147]. Under the regulations the movement of Douglas firs from nurseries is restricted and any trees officially designated as infected must be destroyed within 14 days.

Holland. Under the terms of an Order dated 13th December, 1935, all potato consignments from Great Britain, Germany, and Poland intended for import into, or transport through, Holland must be accompanied by duly authenticated certificates vouching for the freedom of the material from infection by *Synchytrium endobioticum* [ibid., x, p. 293; xv, p. 127] and for the absence of the fungus from the place of cultivation and a surrounding radius of 500 m.

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PAPE (H.). **Die 'Glasigkeit' oder 'Marmorierung' der Kohlrüben und ihre Bekämpfung.** ['Glassiness' or 'marbling' of Swedes and its control.]—*Dtsch. landw. Pr.*, lxiii, 48, p. 603, 2 figs., 1936.

In view of the fact that brown heart of swedes [*R.A.M.*, xvi, p. 82] has begun to cause damage in Germany, the writer briefly describes the symptoms of the disturbance and summarizes the experiments carried out in various countries on its control by the application of borax to the soil.

KADOW (K. J.) & ANDERSON (H. W.). **Brittle root of Horseradish in Illinois.**—*Plant Dis. Reptr*, xx, 18, p. 288, 1936. [Mimeographed.]

For several years the Illinois horse-radish crop has been affected by a disease known as 'brittle root', which in 1936 was responsible for losses of at least 25 per cent. in the St. Louis district. The phloem tissue of the roots, which are very friable, shows a brown to black discoloration, and the plants are wilted.

In all essential features this disorder agrees with the effect of the curly top of beet virus on horse-radish [*R.A.M.*, vii, pp. 227, 691]. The vector of curly top, *Eutettix tenella*, has not been observed in the State, but other leafhoppers occurred in profusion on the diseased stands.

FIFE (J. M.) & FRAMPTON (V. L.). **The P_H gradient extending from the phloem into the parenchyma of the Sugar Beet and its relation to feeding behaviour of Eutettix tenellus.**—*J. agric. Res.*, liii, 8, pp. 581–593, 2 figs., 2 graphs, 1936.

An account is given of experiments in which, immediately preceding or during the inoculation process with curly top [*R.A.M.*, xvi, p. 83 and preceding abstract] by the beet leafhopper (*Eutettix tenellus*) [*E. tenella*], sugar beet seedlings were exposed to an atmosphere containing a high concentration of carbon dioxide for periods varying from two to four hours. The results showed that only a small percentage of the seedlings so treated became infected, the ratio of successful infection in control seedlings to that in treated seedlings being 4·7 : 1. Treatment of the seedlings immediately following inoculation did not reduce the percentage of infection. Histological examination showed that in the petioles of the untreated beet plants 56 per cent. of the tracks of the mouth parts of the leafhopper terminated in the phloem, whereas in those of treated seedlings only 12 per cent. of the tracks ended in

this tissue, the ratio being 4·6 : 1. The striking agreement between the two ratios obtained is considered to be further evidence that the virus of curly top must be deposited in the phloem to ensure infection. Further experiments showed that *E. tenella* prefers an artificial food of P_H 8·5 to one of P_H 5·0, and tests with a microquinhydrone electrode [a description of which is given], constructed in such a way that the P_H value of the individual parenchyma cells could be determined without disturbing adjacent cells, indicated the existence in the petioles of normal beet plants of a gradient in the P_H values, extending from the phloem to the fourth or fifth parenchyma cell, the maximum change being about two units. In plants treated with carbon dioxide, on the other hand, this gradient was entirely upset or even reversed, so that the cell sap of the phloem was no more or even less alkaline than that of the parenchyma. In the treated plants the P_H gradient in the petioles returned to normal when the plants were again exposed to normal atmospheric conditions.

These results are interpreted as indicating that what at first appeared to be resistance to curly top induced in the beet plant by P_H changes in the host, may be attributed to the failure of the insect vector to locate the phloem in plants under the influence of carbon dioxide, owing to the upsetting or reversal of the P_H gradient in the petioles.

Bennett (C. W.) & Esau (Katherine). **Further studies on the relation of the curly top virus to plant tissues.**—*J. agric. Res.*, liii, 8, pp. 595–620, 10 figs., 1936.

The results of the investigations reported in this paper supported the view that the curly top virus [*R.A.M.*, xiv, pp. 549, 813; and preceding abstracts] invades the phloem of the entire vascular systems of infected beet and tobacco plants. In susceptible beet varieties the disease is characterized by necrosis of the phloem and hypertrophy and hyperplasia of the phloem and pericycle, and the liquid content of the phloem percolates through the intercellular spaces of the extra-phloem tissue, and accumulates on the surface of petioles and leaves; in the resistant U.S. 33 variety, the anatomical lesions in the phloem were less extensive, and there appeared to be very little exudation from the phloem. In diseased tobacco plants the degeneration of the phloem was similar to that in beet, but the necrotic areas became cavities, there being no proliferation, as in beet, of the cells adjacent to the necrotic spots; phloem exudation did not occur and the extra-phloem tissues showed no anatomical abnormalities.

Determination of the virus concentrations in the various organs of the resistant beet variety showed a very low content in the parenchymatous regions of the crown and flower stalk, as well as in the ventral side of the petioles, as compared with adjacent regions comprising vascular bundles. The wood and pith of infected tobacco plants also contained much less virus than tissue containing internal phloem. The virus concentration varied from very low in the immature to very high in the mature beet seed, and was apparently highest in the vascular region, though it is improbable that the virus was restricted to the phloem; no virus was recovered from the embryo [cf. ibid., xvi, p. 67]. Heavily infected seeds germinated readily, but no case of curly top

developed in 4,245 plants which were grown from seed balls collected from diseased plants and sown before the virus contained in them was inactivated (i.e., within three months). The curly top virus was recovered from the seeds, capsule walls, the placenta, and from all the flower parts of tobacco, except from the pollen or from parts of the anther devoid of vascular bundles.

These results are considered to indicate that phloem is probably the tissue in which the virus multiplies, and where it evidently attains its highest concentration. Even if the virus does occur in parenchyma cells, its concentration there is evidently very low, and the conditions are probably very unfavourable for its multiplication and spread in these cells.

LEACH (L. D.) & MEAD (S. W.). **Viability of sclerotia of Sclerotium rolfsii after passage through the digestive tract of cattle and sheep.**—*J. agric. Res.*, liii, 7, pp. 519–526, 2 figs., 1 graph, 1936.

Circumstantial evidence having indicated that *Sclerotium rolfsii*, the cause of a rot of sugar beets in the United States [*R.A.M.*, xv, p. 518], is introduced into disease-free areas by means of cattle and sheep, experiments were carried out in which seven sheep and two cows were fed with sclerotia of *S. rolfsii* in addition to their normal diet. The tabulated results showed that from 8 to 28 per cent. of the ingested sclerotia were evacuated in a whole condition in the faeces of the animals, and that from 0·7 to 15 per cent. of the evacuated sclerotia retained their viability. No viable sclerotia were evacuated by the sheep later than 84 hours and by the cows later than 108 hours after ingestion. No whole sclerotia could be found in the digestive tract of two of the sheep which were slaughtered five days after ingesting them. Sclerotia immersed in the liquid contents of sheep rumen were still viable at the end of 48 hours, and a pepsin digestive solution reduced but did not entirely suppress germination during the same period.

These experiments show conclusively that viable sclerotia of *S. rolfsii* can be introduced by sheep and cattle into uninfected fields in a quantity sufficient to cause serious losses in future crops.

Blattbräune der Rüben. [Leaf browning of Beets.]—*Dtsch. landw. Pr.*, lxiii, 43, p. 540, 1936.

According to Dr. Crüger, of the Plant Protection Headquarters, Königsberg, sugar beets and mangolds were severely attacked shortly before the 1936 harvest in many parts of East Prussia by *Cercospora beticola* [*R.A.M.*, xv, p. 337]. Serious reductions of yield from this source are seldom experienced under local conditions, but the diseased foliage is unpalatable and possibly harmful to livestock.

GIGANTE (R.). **Il mosaico del Sedano.** [Celery mosaic.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 99–114, 1 pl., 11 figs., 1936.

In February, 1936, celery growing near Rome was affected by a mosaic causing light green or yellowish chlorotic areas and dark green patches on the leaves, which were wrinkled, with irregular midribs, generally swollen underneath. Light, later dark brown, elongated areas were present on the stalks, which curved over, forming an arc.

Growth was stunted, and the leaves gradually turned yellow and withered, the plant dying before seeding, or when only a few seeds had developed. The disease was transmitted by juice inoculations and by the aphid *Cavariella pastinacae* from diseased to healthy celery and also to vegetable marrow, the symptoms on the latter host closely resembling those reported from America and Italy [*R.A.M.*, xiv, p. 489]. In nature the disease is transmitted by human agency during the usual operations, by agricultural implements, and, chiefly, by the aphid vector; it may also pass from plant to plant directly when these are in close proximity, but no evidence of transmission by seed or soil was obtained. It is thought possible that the infective agent may overwinter on weeds. The disease is considered closely similar both in its external symptoms and its histological characters to the mosaic caused by celery virus 1 [ibid., xv, p. 195], the only difference being the vector.

Control consists in the prompt destruction of infected plants, spacing out, the sterilization of implements, the systematic eradication of weeds, the removal of vegetable marrows from the vicinity, the choice of sites not visited by the aphids or of sites exposed to the wind, and the development of resistant varieties.

Rodigin (M.). К вопросу о морфологической изменчивости **Gloeosporium lagenarium (Pass.) Sacc. et Roum.** [Note on the morphological variability of *Gloeosporium lagenarium* (Pass.) Sacc. & Roum.]—*Acta Inst. bot. Acad. Sci. U.R.S.S.*, Ser. II (*Pl. Cryptogamae*), *1936*, 3, pp. 699–713, 7 figs., 1936. [German summary.]

After briefly referring to the involved taxonomic problem represented by the genera *Gloeosporium* and *Colletotrichum*, the author gives a concise account of his researches in 1929 and 1930 at the Bykovo Plant Protection Station (Lower Volga basin) on the variability of *Gloeosporium lagenarium* [*R.A.M.*, xv, p. 698], which he isolated from anthracnose lesions on watermelon (*Citrullus vulgaris*) and cultured on a number of artificial and natural media, including tomato, apple, pear, and cucumber fruits, and apple, pear, willow, and *Melilotus officinalis* branches and stems. The results showed that on the different substrata the fungus goes through a consecutive series of morphological stages [a brief characterization of which is given], the differences between which are sufficient to warrant each stage being considered as a separate taxonomic unit. From his investigations the author concludes that the subdivision suggested by von Höhnel of the genus *Gloeosporium* is indefinite and based on unsubstantial characters; for instance, the fructifications of *G. lagenarium*, on certain substrata, may develop at the same time both over the epidermal cells (below the cuticle) and far below them. Jaczewski's genus *Pseudogloeosporium* is only a stage in the life-cycle of certain species, and cannot be retained as a distinct genus. This is demonstrated by the fact that on certain media *G. lagenarium* produces a well-developed pseudopycnidial wall. The formation or non-formation of setae in the cultures appeared to be independent of whether the isolation was made from a strain naturally abundantly provided with, or entirely devoid of, setae, and this shows that the genera *Gloeosporium* and *Colletotrichum* cannot be distinguished by the presence or absence of these organs. When cultured on

the rind of the watermelon variety 'Belokory belosemenny' [white-rinded white-seeded], *G. lagenarium* produced an abundance of gelatinous tendrils of spores which emerged from cracks in the surface; this is thought to be the first recorded observation of such tendrils in the genus *Gloeosporium*, and indicates a close relationship to the genus *Naemospora*.

On the basis of these investigations the author considers that current views on the constancy of genera and species, as taxonomic units, must be revised in the sense that these units are essentially variable and may in one way or another give rise to new forms.

Milisavlievič (D.). О узроцима пропадања Винограда у Фрушкој Гори. [On the causes of the dying-off of the Vine at Frouchka Gora.]—*Arh. Min. Poljoprivrede, Belgrad*, iii, 5, pp. 117–137, 12 figs., 1936. [French summary.]

An account is given of investigations on the widespread diseased condition of the vine at Frouchka Gora, Jugo-Slavia, frequently resulting in the death of young grafted stocks. The results showed that it is due to three different diseases, namely, 'pith disease' associated with *Pumilus medullae* [*R.A.M.*, xv, p. 631], 'broussins' [ibid., xiv, p. 676], and a bacterial gummosis, the causal organism of which was isolated and identified as *Bacillus vitivorus* [ibid., ix, p. 504] (with which *B. baccarinii* [ibid., xi, p. 281] and *Bacterium gummis* are synonymous). *P. medullae* produced in pure culture a milk-white mycelium which gradually deepened in colour and formed pycnidia after a few months; these organs, as well as spermogonia, were also produced on pieces of vine shoots placed in liquid media in flasks. Both spermogonia and pycnidia, as well as sclerotia, were found in nature but perithecia were not observed. The disease was experimentally reproduced in each of ten young grafted stocks which were inoculated at the time of grafting in the spring of 1935 with a pure culture in the graft union; the characteristic blackening of the wood and of the pith were very marked near the point of inoculation. Field observations in two localities tended to indicate that 'broussins' are caused by late spring frosts below —3° C. Inoculation experiments with *B. vitivorus* on a number of vine cuttings during 1935 resulted in the vessels becoming filled with gum and developing tyloses, and in the cuttings striking very poorly and producing malformed, chlorotic shoots. The organism was re-isolated from the infected plants. Occasionally two or all three of these diseases were observed on the same vine-stocks, a fact which has hitherto helped to obscure the real causes of the condition.

Rees (J.). **Glamorgan crop plants and their diseases.**—*Glam. County Hist.*, i, Nat. Hist., pp. 232–241, 1936.

Notes are given on diseases (mostly well-known) of cereals, pulse crops, potatoes, root, forage, and pasture crops, vegetables, and fruit in Glamorgan, among which may be mentioned mid-vein spot of red clover [*Trifolium pratense*] (*Mycosphaerella carinthiaca*), leaf spot of sainfoin [*Onobrychis sativa*] (*Ascochyta orobis* var. *onobrychidis*), and black blotch of raspberries (*Cryptosporium minimum*) [*R.A.M.*, xiv, p. 171].

Montemartini (L.). **Nuove osservazioni sui parassiti e le malattie delle piante coltivate nella Sicilia occidentale: triennio 1934–36.** [New observations on the parasites and diseases of plants grown in western Sicily: three-year period 1934–36.]—*Riv. Pat. veg.*, xxvi, 9–10, pp. 355–377, 1936.

This report on plant diseases in western Sicily [cf. *R.A.M.*, xiii, p. 424] includes, *inter alia*, the following items of interest. Wheat near Palermo was attacked by *Mastigosporium album* [*Dilophospora alopecuri*: ibid., xvi, p. 184], apparently a new record for Italy. Apple fruits were infected by *Sclerotinia fructigena* which had gained entrance through injuries caused by *Rhynchites bacchus*. Satisfactory results in the control of 'brusone' disease of loquats (*Bacillus amylovorus*) [ibid., xi, p. 117; xiv, p. 778] were given by copper sprays, and in two of the worst affected localities this method has been generally adopted. The pistachio [*Pistacia vera*] leaf spot previously reported [ibid., xiii, p. 424] was found to be due to *Septoria pistaciarum* n.sp. [without a diagnosis], the pycnidial stage of *Pleospora montemartinii*. Castor oil [*Ricinus communis*] was severely infected by *Melampsorella ricini* [ibid., xvi, p. 207], and tobacco by root rot due to *Bacillus tabacivorus*. Beans [*Vicia faba*] were attacked by *Botrytis fabae* [ibid., xvi, p. 20]. The upper surface of the leaves of *Quercus lanuginosa* var. *microspora* showed abundant infection by the perithecia of *Microsphaera quercina* [ibid., xv, p. 473], which developed in midwinter, after a fortnight's rain. The leaves of *Phormium tenax* were infected by *Cryptosporium rhodocyclum*. Forcasting stations for the issue of spray warnings against attacks of vine mildew [*Plasmopara viticola*: ibid., xvi, p. 86] are being organized.

Jahresbericht der Versuchs- und Forschungsanstalt für Wein-, Obst- und Gartenbau in Geisenheim-am-Rhein. [Annual Report of the Viticultural, Fruit Growing, and Horticultural College at Geisenheim-am-Rhein.]—*Landw. Jb.*, lxxxiii, 6, pp. 829–857, 1936.

The following items of phytopathological interest, in addition to some already noticed from other sources, occur in this report [cf. *R.A.M.*, xv, p. 479] covering the financial year 1935. Twig lesions were found by C. F. Rudloff, W. Herbst, and E. Schneiders to provide the major amount of spring inoculum of pear scab (*Venturia pirina*) [ibid., xvi, p. 45]. Some promise of effective control of the fungus by means of decoctions and extracts of representatives of the Ranunculaceae, Solanaceae, and Compositae was given by laboratory experiments. The investigations on polymorphism in *Venturia* were extended to the species infecting *Sorbus* [*Pyrus*] *aucuparia*, *S. domestica* [*P. sorbus*], and *Pyracantha coccinea* [ibid., xv, p. 230], with the result that a large number of forms were differentiated on the two first-named, while the strain on the last comprised only a few.

In connexion with the spraying experiments against apple scab (*V. inaequalis*) already reported [ibid., xv, p. 813], it is mentioned by F. Stellwaag, T. Gante, and Zimmer that Bayer's and Wacker's Kupferkalk compounds [ibid., xiv, p. 79; xv, p. 539] belong to the copper oxychloride group, and as such are more liable to induce

scorching of pome fruits [ibid., xv, p. 813] than copper arsenate preparations, e.g., nosprasit 0.

Cladosporium (*Rhacodium*) *cellare* [ibid., xv, p. 631] was found by K. Kroemer and H. Schanderl to be entirely innocuous in the wine cellar, since growth was inhibited in nutrient solutions containing 3 per cent. alcohol by volume. On the other hand, it should be stringently excluded from sweet must cellars, where it may do considerable damage, being capable of assimilating ethyl and amyl alcohol and converting them into fats.

The intracellular cordons associated with the 'reisig' disease of vines [ibid., xv, p. 497] were detected by K. Kroemer, H. Moog, and G. Troost in a number of other woody plants, including *Acer pseudoplatanus*, birch (*Betula alba* and *B. verrucosa*), *Corylus avellana*, pines (*Pinus sylvestris* and other species), poplar (*Populus* spp.), *Vitis heterophylla*, apricots, cherries, plums, mirabelles [*Prunus divaricata*], peaches, and currants.

GALLOWAY (L. D.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst. Pusa*, 1934–35, pp. 120–130, 1936.

During the period under review confirmation was obtained of earlier observations indicating that wheat bunt [*Tilletia caries*, *T. foetens*, and *T. indica*] does not develop even from heavily inoculated seed under Pusa conditions [*R.A.M.*, xv, p. 7]. Evidence of soil-borne infection was obtained at Karnal.

Examination of 'black point' wheat seed showed that 70 per cent. of the seed contained *Helminthosporium sativum* [ibid., xv, p. 703], while others contained *H. tritici-repentis*, an *Alternaria*, and a *Fusarium*. The mycelium was present within the seed-coat and was not destroyed by surface sterilization.

Examination of smutted oats from 24 areas in northern India confirmed the view that the predominant oat smut in that locality is *Ustilago kolleri*. Seed for nearly 100 acres treated two or three weeks before sowing with formalin dry spray yielded under 0·01 per cent. infection, compared with 4 per cent. for untreated seed in previous years [ibid., xiv, p. 160].

When seed from rice plants infected with *Ustilaginoidea virens* [ibid., xiii, p. 652] was grown in pots of normal soil, and healthy seed was grown in pots of artificially infected soil, no disease resulted, confirming the view that *U. virens* is neither seed- nor soil-borne.

In December, 1933, a severe root disease of tobacco resembling black shank occurred in Madras; comparisons of isolations from the infected material with cultures of *Phytophthora parasitica* var. *nicotianae* [ibid., xiv, p. 608] from Florida and Java showed that though slower in growth they agreed well with the latter. At Pusa mortality due to the Madras fungus was low or nil in winter, but very high from April to October on seedlings in infected soil.

Preliminary investigations of potato types suitable for northern India showed the following diseases to be important locally, viz., tip or hopperburn, *Alternaria* blight [*A. solani*], *Rhizoctonia* rot (*R.* [*Corticium*] *solani*), (possibly) *Fusarium* wilt, and leaf roll, streak, crinkle, and other mosaic diseases. On the tubers *Spongospora subterranea*, *C. solani*, and *F. oxysporum* were observed. Bacterial rot was common in

storage, one of the types frequently found agreeing with *Bacterium solanacearum*. Symptoms resembling spraing [ibid., xv, p. 468] were observed.

A white rot of grape vines occurred at Pusa, apparently due to a new species of *Coniella*. The stems and leaves became brown and shrivelled, and in advanced cases the berries turned brownish-grey and dried up. The one-celled, hyaline, later dark brown conidia were borne all round the inner surface of the pycnidia; perithecia were also found. Inoculation tests showed that infection can occur through wounds.

To determine whether the stimulation of oospore production in certain strains of *Phytophthora* grown in association with another strain is due to chemical stimulation or to heterothallism, an unheated filtrate from a paired culture of *P. meadii* and *P. colocasiae* (strains not producing oospores) that had formed oospores was added to quaker oat agar, and plate cultures of the species grown separately. *P. meadii* in the presence of the filtrate formed amphigynous oospores at 23° C.; *P. colocasiae* formed a few oospores at a higher temperature only.

Examinations of different soils from Pusa and of two from other sources showed *Cladosporium* and *Fusarium* to be frequently present; other isolations included *Rhizopus arrhizus*, *Cunninghamiella* sp., *Chaetomium indicum*, *Alternaria* spp., *H. sativum*, *Acrothecium lunatum* [*Curvularia lunata*: ibid., xvi, p. 156], and *Phoma*, *Melanconium*, *Byssochlamys*, and *Trichosporium* spp. [ibid., xv, p. 824].

In the second part of this report it is stated that in further experiments on the effect of sugar-cane mosaic on tonnage [ibid., xiv, p. 257] diseased Co. 213 canes yielded approximately 10 per cent. less stripped cane than the healthy cane. The sugar-cane varieties Co. 205, 346, 349, 368, 380, 381, and 391 were found to be infected by smut (*U. scitaminea*) [ibid., xiii, p. 473] at Karnal. The fungus was isolated from Co. 205, 213, 290, 368, and 391, and grew well on potato dextrose, Richards's, and Dox's agars. In culture, chlamydospores were rare, but secondary sporidia formed freely. Infection of P.O.J. 2878, Co. 416, and Co. 419 was obtained by infecting the buds of setts with spores or sporidia; in one case infection took place through the cut ends.

Annual Report of the Mycological Section for the year ending the 31st March 1936.—*Rep. Dep. Agric. Cent. Prov. Berar*, pp. 26–29, 1936.

In an experiment carried out at Nagpur, India, cotton seedlings in untreated control plots showed 7·8 per cent. deaths from anthracnose [*Glomerella gossypii*: *R.A.M.*, xvi, p. 173], as against only 3·8 per cent. in a plot sown with seed delinted with sulphuric acid.

Sorghum seed dusted with copper carbonate, sulphur (1 oz. per 24 and 48 lb. seed), abavit B, ceresan (1 oz. per 28 lb.), or agrosan G (1 oz. per 10 and 20 lb.) gave 0·08 to 0·2 per cent. covered smut (*Sphacelotheca sorghi*) [ibid., xvi, p. 87], as against 11·2 per cent. in the untreated control plot.

The groundnut disease caused by *Cercospora personata* and *C. arachidicola* [ibid., xv, pp. 2, 284] was effectively controlled by the application of Bordeaux mixture 2–2–50 plus linseed oil or agral I at the beginning of August and a month later; a third spray should be given if the weather is very wet.

Damping-off of tobacco seedlings caused by a species of *Phytophthora* was observed at Nagpur in the beginning of October, 1935, but was completely checked by the removal of the infected plants and irrigation of the beds with Bordeaux mixture (4–4–50).

Tenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1936.—96 pp., 1936.

In this report it is stated that boric acid applications markedly reduced the incidence of internal cork in the Sturmer Pippin and Granny Smith apples, but had no appreciable effect on the Cleopatra variety [*R.A.M.*, xv, p. 481; xvi, p. 186].

In storage investigations with Jonathan apples in Victoria it was found that the maximum development of scald [ibid., xvi, p. 107] occurred in the samples delayed for four days at 65° before being stored at 32°. Scald incidence decreased as the delay period increased, and susceptibility appeared to be greatest during the climacteric. The condition occurred mainly at 32° and, to some extent, at 34° in fruit from two localities picked at the green-yellow stage. Colour was less important, however, than date of picking, for green-yellow apples picked in late March developed scald while similarly coloured fruit picked three weeks later remained unaffected. Scald appears to be a low temperature disorder affecting certain fruits and largely controllable by delayed storage before storage at 32°, or by storage at 36°. Storage atmospheres containing 5 per cent. of carbon dioxide did not affect the incidence of soft scald and breakdown in more mature Jonathan apples, but reduced breakdown in apples of the first picking. When atmospheres containing 10 per cent. of carbon dioxide were used brown heart [ibid., xvi, p. 185] began to appear.

Investigations into the strains and saltants of *Gloeosporium musarum* [ibid., xv, p. 451] showed that one strain was isolated so frequently as to indicate that it was the only one of economic importance. Inoculations into green bananas in the field suggested that infection by *G. musarum* can take place through injuries in immature fruit. It was also found that fruit from plantations with an average of up to three dead leaves per plant developed significantly less infection than fruit from plantations averaging more dead leaves per plant, the pustules of *G. musarum* on dead and dying leaves being apparently the source of infection.

The high percentage of wastage by blue and green moulds [*Penicillium italicum* and *P. digitatum*] observed in the packing sheds on citrus fruits from the Gosford area was ascertained to be due to the fact that atmospheric contamination was favoured by humidity and temperature. It was shown that the more serious 'rub' type of injury can be reduced by suitable modifications by 60 per cent., and further work should aim at the elimination of wounding since it is practically impossible to exclude mould from the orchards. In Washington Navel and common oranges picked on three dates and stored at temperatures ranging from 34° to 50° F. the chief defects of the rind responsible for wastage were storage spot [pitting: ibid., xv, p. 498], scald [loc. cit.], goose-flesh, and skin collapse. Both lateral and stem-end storage spot occurred chiefly in fruit picked early and stored at 40°, and was largely

controlled by the use of higher storage temperatures and (to some extent) by sweating at 70° before storage at 40°. Scald and goose-flesh are low temperature disorders which occur at 37° and 34°, respectively, and are controllable by storage at higher temperatures. Skin collapse appeared to be a normal disorder accompanying the last stages of senescence.

A preliminary survey of tobacco virus diseases in Tasmania and Victoria showed that spotted wilt was the most serious tobacco disease in Tasmania [ibid., xv, p. 689] and that mosaic was common but comparatively unimportant in both States. Spotted wilt was observed for the first time at Shepparton and Eurobin, Victoria.

Experimental evidence showed that applications of nitrogenous fertilizers controlled root rot of peas [*Aphanomyces* sp.: ibid., xiv, p. 425], the increased yields obtained being sufficiently large to indicate that the treatment may be commercially practicable.

Pine trees affected with needle-fusion [ibid., xv, p. 481] appeared to recover when replanted in good soil, but became diseased again when put back into poor soil.

HANSFORD (C. G.). **Annual Report of the Mycologist, 1935.**—*Rep. Dep. Agric. Uganda, 1935–36.* (Part II), pp. 40–42, 1936.

The cotton wilt associated with a species of *Fusarium* [?*vasinfectum*: *R.A.M.*, xv, p. 426] in the Buganda Province, Uganda, which has hitherto been sporadic, is now commonly attacking groups of plants in many native plots, though the effect on the cotton crop as a whole is still negligible. In the field the only diagnostic symptom is the presence of yellow to brown streaks running longitudinally through the woody tissues of the stems and roots. Many plants of all ages and sizes even late in the season show a sudden wilting of the leaves, followed by a browning of the leaf blades between the main veins, beginning at the margin. These leaves quickly dry up and fall. In a more obscure or 'chronic' form of the disease the plants merely appear to be poorly developed, and produce little or no crop.

For three seasons attempts have been made to develop disease-resistant plants by selecting seed from resistant individuals grown in heavily infected plots, and a system is being developed whereby seedlings resistant when grown in inoculated soil in the laboratory are transferred to the field. In many instances, seeds of susceptible varieties planted in pots containing inoculated soil failed to germinate. The tissues inside were found to be invaded by the fungus, a rot being set up which attacked the young root and finally involved all the tissues of the embryo. In other cases germination occurred and the cotyledons appeared above the soil, but little further growth took place and the seedlings died; though fair development of the shoot had taken place in three plants, the root system remained almost entirely undeveloped. Susceptible plants which escaped these two types of infection showed more typical symptoms. As a rule, infection occurred on the hypocotyl and resembled sore shin, hitherto attributed locally to *Rhizoctonia* [*Corticium*] *solani*. The surface of the infected tissues was reddish, later dark brown. A number of different strains of *Fusarium* which were isolated from the discoloured streaks are being tested for pathogenicity.

In an appendix (by H. R. Hosking) it is stated that the cotton varieties S.P. 20 and S.P. 72 showed less blackarm [*Bacterium malvacearum*] in variety trials than N.17 and S.G. 29. The most satisfactory method of estimating the degree of infection by blackarm was by determining the number of lesions per lb. of plant tops cut off at ground level, this figure representing 'intensity of infection'. Results obtained by this method indicated that close spacing increased intensity and that the earlier the sowing date the higher the intensity of the disease.

LOPATIN (M. I.). Поражаемость растений возбудителем корневого рака растений **Bact. tumefaciens.** [The susceptibility of plants to the agent of crown gall of plants, *Bact. tumefaciens.*]—Микробиол. [*Microbiol.*], v, 5, pp. 716–724, 1936. [English summary.]

Only 21 out of 101 species of plants belonging to 32 families showed apparent immunity from crown gall (*Bacterium tumefaciens*) in the writer's inoculation experiments at the Uman Agricultural Institute [province of Kieff] from 1931 to 1934, viz., *Centaurea cyanus*, *Chrysanthemum indicum*, *Salvia verticillata*, soy-bean, French bean (*Phaseolus vulgaris*), *Lathyrus odoratus*, *Rosa canina*, *Papaver rhoeas*, *P. somniferum*, *Chelidonium majus*, barberry, lime (*Tilia parvifolia*), peony, *Buxus sempervirens arborescens*, *Heliotropium suaveolens*, *Primula obconica*, *P. chinensis*, *P. malacoides*, *Pentstemon hybridum*, *Cactus*, and *Arum*. Among the very susceptible species were tomato, *Datura stramonium*, sunflower, beet (excessively severe infection) [*R.A.M.*, xv, p. 133], cucumber and other cucurbits, *Pelargonium zonale* [ibid., xv, p. 782], hemp, and *Ricinus communis*.

DAVYDOFF (P. G.). Машины для протравливания зерна. [Cereal seed-grain disinfecting machines.]—*Mechanization of Plant Protection, Bull. Pl. Prot. Leningr., Ser. III* (*Control measures and implements*), *1936*, 8, pp. 97–122, 6 figs., 10 graphs, 1936.

A detailed and fully tabulated account is given of the results obtained from tests of seven cereal seed-grain disinfecting machines of Russian construction [cf. *R.A.M.*, xvi, p. 23], which showed that, after some minor structural defects have been remedied, Borghardt's combined apparatus for wet, semi-dry, and dry treatment of the seed, capable of treating up to 21 tons per 10-hour day, is the best adapted for medium and large estates. Satisfactory results were also obtained with Popoff's dusting apparatus [ibid., xiv, p. 47], capable of an output of 6 or 7 tons per hour with 9 attendants. Mention is also made of P. N. Davydoff's apparatus for treating the seed with formaldehyde vapours, which does not affect injuriously the germinability of the seed; the apparatus in its present form presents, however, some defects, such as not being gas-tight, and inadequacy of the formalin solution heating contrivance, but could be usefully employed if these were remedied. None of the other machines tested was satisfactory.

HASSEBRAUK (K.). **Die Ergebnisse der Getreiderostforschung der letzten 10 Jahre.** [The results of cereal rust research during the last 10 years.] —*Forschungsdienst*, ii, 10, pp. 503–517; 11, pp. 568–581, 1936.

This is a critical review of the literature published in various countries

during the last ten years (up to July, 1936) on different aspects of cereal rust (*Puccinia* spp.) research. Many of the papers included in the bibliography of 633 titles have been noticed from time to time in this *Review*.

GASSNER (G.) & HASSEBRAUK (K.). **Untersuchungen zur Frage der Getreiderostbekämpfung mit chemischen Mitteln.** [Investigations on the question of cereal rust control by chemical means.]—*Phytopath. Z.*, ix, 4, pp. 427–454, 1936.

A detailed, fully tabulated account is given of greenhouse experiments in the control of cereal rusts (chiefly form 14 of *Puccinia triticina* [*R.A.M.*, xiv, p. 748] on Strube's Squarehead wheat and form 2 of *P. simplex* [*P. anomala*: ibid., xiv, p. 624] on Friedrichswerth Berg winter barley) by the application to the surface soil of the pots, after sowing the seed, of 174 organic compounds, at rates of 1·2, 12, 24, and 120 mg. per kg. soil, the subsequent development of the rusts being recorded after a certain length of time according to a key [which is described]. Of the chemicals tested only a small number effectively inhibited rust development. Certain promising materials, including chloranil, dimethylcumanon, a-naphthol [ibid., xiii, p. 790], and nitrodibrombenzol, were found to owe their efficacy to the evolution of volatile toxic substances which inhibit spore germination without damaging the host tissues, and the possibility of utilizing such preparations for dusting the growing crop is briefly discussed. Other preparations were effective though not forming gas, e.g., acridin (against wheat rust only), 1-brom-2-naphthol, picric acid, and p-toluolsulphochloramide sodium; in some cases the roots apparently assimilate sufficient quantities of the compounds to induce an internal therapeutic action. Nitrodibrombenzol exerted a stronger repressive action on *P. anomala* than on *P. triticina*, whereas acridin and tolan acted in the opposite manner. The possibility of chemical immunization of cereals against rusts was strengthened by supplementary tests in which the compounds were incorporated with the soil in the pots instead of being strewn over the surface. The incidence of *P. triticina* and *P. graminis* (form 79) on a number of wheat varieties was further reduced by the suspension of the leaves in solutions of sodium sulphide (up to 1 per cent.), but in some cases this beneficial effect was counteracted by necrotic injuries.

It is emphasized that the conclusions to be drawn from these experiments are so far purely theoretical and cannot be applied on a practical basis pending further investigations.

GASSNER (G.) & STRAIB (W.). **Untersuchungen zur Bestimmung der Ernteverluste des Weizens durch Gelb- und Schwarzrostbefall.** [Investigations on the determination of harvest reductions in Wheat through yellow and black rust infection.]—*Phytopath. Z.*, ix, 5, pp. 479–505, 4 diags., 1936.

In order to determine the yield reductions caused by *Puccinia glumarum* and *P. graminis* in wheat varieties of differing reaction to these rusts, the writers laid out the plots for inoculation in the midst

of a stand of oats, the control plots being situated at a distance of 28 m.

In 1930 a moderately severe attack of yellow rust, lasting from the end of May to the end of June, resulted in a reduction of 14 per cent. in the grain yield of the susceptible Red Schlanstedt, while in 1931 the losses in the three susceptible varieties, Ackermann's Bayernkönig, Pflug's Baltic, and Strube's Squarehead, ranged from 11 to 18 per cent. under comparable infection conditions persisting from the middle of May to the middle of June. The grain reduction in Heine's Club summer wheat grown in pots in the open in 1933 and exposed to a severe five-week epidemic of *P. glumarum* amounted to 25 per cent., the corresponding figure for Oregon being 14 per cent. In parallel experiments with black rust, a comparatively severe attack, lasting about a fortnight, caused losses of 24 and 14 per cent., respectively, in the two summer wheats, Red Schlanstedt and v. Rümker's Squarehead.

The 'injury coefficient' was calculated on the percentage yield reduction induced by each week's rust attack of a certain degree of severity, on which basis moderately heavy infection of wheat by yellow rust during the actual vegetative period of the crop caused a weekly loss of 3 per cent., the corresponding figure for a severe epidemic being 5 per cent. For black rust the figures are still higher, but in practice the effects of the latter are ordinarily less noticeable, since severe infection, under German conditions, does not usually develop until shortly before the harvest.

The years selected for these experiments were not typical 'rust years', and the figures obtained probably do not by any means represent the maximum losses to be expected. A deterioration in the quality of the grain was observed to accompany the reduction in yield. Although the losses from rusts are relatively less heavy in resistant than in susceptible varieties, the exclusive cultivation of the former, irrespective of local conditions, is not to be recommended, experience having shown that, in certain localities, the yield of susceptible wheats may exceed that of resistant. In this connexion attention is drawn to the importance of the annual varietal cultivation tests conducted by the Reich Food Board.

HASSEBRAUK (K.). **Pilzliche Parasiten der Getreideroste.** [Fungal parasites of the cereal rusts.]—*Phytopath. Z.*, ix, 5, pp. 513–516, 1936.

Hitherto the only fungi known to parasitize the uredosori of the cereal rusts (*Puccinia* spp.) were *Olpidium uredinis* and *Darluca filum* [*R.A.M.*, xv, p. 528], but the writer has observed *Verticillium niveostratosum* parasitizing *P. graminis*, *P. glumarum*, and *P. triticina*, and *Cephalosporium acremonium* parasitizing *P. graminis*. A verticillate fungus found on *P. coronifera* [*P. lolii*] was ascertained by Wollenweber to agree in essentials with *Acrostalagmus fungicola*, which is renamed, in view of the prospective amalgamation of *Verticillium* and *Acrostalagmus*, *V. fungicola* n.comb. *P. lolii* was also parasitized by an organism of uncertain identity, possibly a species of *Fusidium*, *Spicaria*, or *Cylindrium*. A *Verticillium* with a snow-white mycelium of a more compact and felt-like consistency than that of *V. niveostratosum* and

spherical (3·6 μ) or tapering conidia, occurs on *P. glumarum* and *P. simplex* [*P. anomala*].

Greenhouse inoculation experiments with the rust parasites gave positive results only on plants permanently maintained in a saturated atmosphere. *V. niveostratosum* produced heavy infection on *P. graminis*, *P. triticina*, *P. glumarum*, *P. lolii*, and *P. anomala*, *P. dispersa* [*P. secalina*] being less heavily involved. The uredosori, if formed at all, were covered with a white, somewhat crusty-looking mycelium, and produced no viable spores. *C. acremonium* attacked all the rusts except *P. secalina*, covering the entire zone of infection with its abundant, loose mycelium, several millimetres in thickness; *P. anomala* and *P. lolii* produced teleutospores or black spots in place of uredospores. *V. fungicola* also parasitized all the rusts, *P. secalina* again being the most resistant. Symptoms similar to those induced by the foregoing and *V. niveostratosum* were caused by the two unidentified fungi. In a further series of trials, *V. niveostratosum* parasitized *P. suaveolens* [ibid., viii, p. 791; xiv, p. 52], *P. symphyti-bromorum* [ibid., xii, p. 499], *P. taraxaci*, and *P. asparagi* [ibid., xv, p. 627] in addition to *P. graminis*.

Owing to their exacting moisture requirements there is no question of utilizing the fungi under observation for practical rust control. They are apt, however, to constitute a hindrance to the multiplication of the rusts for experimental purposes in the greenhouse, especially during the dark winter months. Airing the plants by removal of the covering bell jars 48 hours after inoculation reduces the incidence of the parasites, but this measure is inapplicable to *P. glumarum*, for the development of which abundant humidity is requisite.

SCHILCHER (E.). **Rostbekämpfung mit Kalkstickstoff.** [Rust control with calcium cyanamide.]—*Landeskultur*, iii, pp. 176–178, 1936. [Abs. in *Z. ges. Getreidew.*, xxiii, 10, p. 208, 1936.]

Disappointing results have again been obtained [in Austria] in experiments with calcium cyanamide for the control of brown rust of wheat [*Puccinia triticina: R.A.M.*, xiv, p. 500]. At the most the compound exerts a retarding influence on the development of the disease, which is counteracted by more or less severe scorching of the plants.

ASUYAMA (H.). **Widerstandsfähigkeit von gewissen japanischen Weizen gegen zwei biologische Typen des roten Rostpilzes.** [The resistance of certain Japanese Wheats to two biologic forms of the red rust fungus.]—*J. Pl. Prot.*, xxii, pp. 179–185, 1935. [Japanese. Abs. in *Jap. J. Bot.*, viii, 3, p. (39), 1936.]

The results of inoculation experiments with two biologic forms of *Puccinia triticina*, one from Akita and the other from Saitama [*R.A.M.*, xiv, pp. 59, 299], revealed differences not only among the Japanese wheats tested in their reaction to the rust forms, but the same varieties showed diverse degrees of resistance according to the locality of origin. A variety distinguished by marked resistance in the seed-bed behaved similarly in the field.

Safronova (Mme N. I.). Сравнительная оценка некоторых методов экспертизы семян Пшеницы на мокрую головню **(Tilletia tritici).** [Comparative studies of certain methods for the detection of bunt (*Tilletia tritici*) infection in Wheat seed-grain.]—*Pl. Prot. Leningr., 1936*, 8, pp. 115–128, 1936.

Comparative tests and statistical analyses are described of Lobik's original method for detecting the presence of bunt (*Tilletia tritici*) [*T. caries*] spores in wheat seed-grain, and of the same method as modified in 1931. According to the original method two samples each of 100 grains are separately washed for ten minutes in 10 c.c. of water; a calibrated drop of the spore suspension is then placed on a glass slide under a cover glass, and the spores are counted in 15 optical fields taken on two diagonals of the preparation, the actual spore load per grain being calculated from the average number of spores in the optical fields in the two samples, multiplied by a constant coefficient representing the number of drops per c.c., and divided by 100. The modification of the method introduced in 1931 consists in centrifuging the spore suspension obtained from the samples, diluting the spore sediment in 5 c.c. of distilled water, and computing the spore load as above mentioned. The results showed that the latter method is more sensitive than the former, being able to detect differences in infection of the order of 1 in 100,000; the spore load per grain is always considerably higher as calculated by the original method than by the modified method and the latter gives much narrower fluctuations, e.g., for 0·01 per cent. (by weight) artificial infection the original method gave from 526 to 1,185 spores per grain and the modification 235 to 470 spores. A third method, suggested by Khodakovsky in 1931, consisting in the direct count of the spores present on a wheat grain with the help of a binocular microscope is not considered practical, since it is too lengthy, extremely trying to the eyesight, and inaccurate with heavy contaminations.

Artificial grain inoculation experiments with a wheat which naturally gave 0·21 per cent. bunt infection in the field, showed that the amount of resulting bunt increased progressively with the quantity of spores added, e.g., added spore loads of 0·005, 0·03, 0·1, and 0.5 per cent. (by weight) resulting in 1·44, 10·46, 25·56, and 71·16 per cent. infection, respectively.

Milan (A.). **Intorno alla simultanea presenza dei parassiti 'Tilletia tritici' (Bjerk.) Wint. e 'Ustilago tritici' (Pers.) Jens. su piante di Frumento.** [On the simultaneous presence of the parasites *Tilletia tritici* (Bjerk.) Wint. and *Ustilago tritici* (Pers.) Jens. on Wheat plants.]—*Nuovo G. bot. ital.*, N.S., xliii, 3, pp. 586–599, 1936.

When seed of the early wheat varieties Mentana and Gentil rosso mutico (*a*) from healthy plants, (*b*) from inflorescences inoculated with *Ustilago tritici*, (*c*) inoculated with *Tilletia tritici* [*T. caries*], and (*d*) with both fungi, were thickly sown in boxes in July, 1933, 92 per cent. of the resulting plants from the Mentana seed infected with *U. tritici* alone were affected with smut, 80 per cent. of those from the seed

inoculated with *T. caries* alone were bunted, and those from the seed infected with both fungi showed 92·5 per cent. with smut only, 1 per cent. bunt only, and 3·7 per cent. both diseases. The corresponding figures for Gentil rosso mutico were 98, 87, 97, 0, and 2 per cent. In the Mentana wheat the average height of the culms for the three types of infection was, respectively, 55, 54, and 46 cm., as compared with 68 cm. for the controls, the corresponding figures for Gentil rosso mutico being 70, 70, 64, and 85 cm.

These results were confirmed by further experiments later in the season, in which the seedlings were transplanted either close together or widely spaced. Only under the latter conditions did earing take place and the following additional data were obtained. The Mentana plants from the seed infected with *U. tritici* only showed 87 per cent. diseased plants and 74 per cent. diseased ears, while those from seed infected with *T. caries* only showed 82 per cent. diseased plants and 67 per cent. diseased ears, and those from seed infected with both fungi showed 85 per cent. plants with smut only, 6 per cent. with bunt only, and 3 per cent. with both diseases. The completely smutted Mentana plants averaged 2·4 culms, the completely bunted ones 3·4 culms, and those infected with both fungi and showing smutted ears 1·9 culms, those doubly infected and showing bunted ears having 3·2 culms, as against 5 culms in the healthy controls. Similar results were obtained with Gentil rosso mutico wheat.

It is concluded that in wheats parasitized by both fungi, the antagonism set up between the two parasites results in markedly heavier infection by *U. tritici* than by *T. caries* which is to a large extent suppressed, both when the plants are close together or widely spaced. When both infections were present on headed plants marked distortion of the culms resulted.

LANGE DE LA CAMP (MARIA). **Gewinnung und Kultur der Haplonten von Ustilago tritici.** [The isolation and culture of haplonts of *Ustilago tritici*.]—*Phytopath. Z.*, ix, 5, pp. 455–477, 16 figs., 1936.

By exposing germinated spores of *Ustilago tritici* on 3 per cent. beer wort agar to temperatures of 2° to 4° C. for three or four days, the writer succeeded in inducing the separation of the four haploid cells of the promycelium, in such a way that each segment could be isolated and cultured independently. The reaction to sudden cold varies in intensity for the different strains and can be stimulated by increasing the concentration of the nutrient medium. An extraordinary degree of variability was observed among the haploid lines within a given group of approximately equal pathogenicity to the differential wheat varieties used at the Halle Plant Breeding Station [*R.A.M.*, xi, p. 774; xiv, p. 620], without any apparent correlation between growth type and virulence. Hyphal fusions, fusion bridges, and binuclear hyphae were detected in fixed and stained preparations of cell suspensions of different sexes, but were absent from those derived from a haploid line or two lines of the same sex. A simple macroscopic method of determining the sex of individual haplonts was found, based on the fact that colonies of different sex develop a light streak in the zone of contact, whereas this does not appear when the colonies are of the same sex.

The procedure adopted was to plant inoculum from the culture to be tested on potato dextrose agar in Petri dishes between transfers from known plus and minus strains. According to results so far obtained there is in *U. tritici* a simple bipolar sexuality. A morphological, secondary sex character was also observed within two strains.

VISSER (M. F.). **Warmwater-trommelontsmetter tegen stuifbrand.** [A hot water drum disinfection apparatus against loose smut.]—*Tijdschr. PlZiekt.*, xlii, 10, pp. 275–290, 1 pl., 1 fig., 3 diags., 1936.

The author describes in detail an apparatus for the hot water treatment of seed-grain against loose smuts, especially that of wheat [*Ustilago tritici*], which is stated to be greatly on the increase in Holland [see next abstract]. The machine consists essentially of a perforated drum capable of rotation by means of a handle in water raised to the desired temperature (53° C.) by steam generated in a separate boiler and introduced by a jet into the disinfection apparatus. For filling or removal of the seed-grain the drum is raised and run on to a stand with a small waggon below it into which the material can be emptied. The apparatus is designed for a capacity of 1 or 2 hectol. and the time taken for treating each charge is 15 mins. (including 5 minutes for recharging).

OORT (A. J. P.). **Problemen bij de bestrijding van de brandziekten der granen.** [Problems in the control of cereal smuts.]—*Tijdschr. PlZiekt.*, xlii, 11, pp. 291–302, 2 diags., 1936. [English summary.]

Some of the problems involved in the control of cereal smuts in Holland are discussed, with special reference to the loose smuts of wheat (*Ustilago tritici*) [see preceding abstract] and barley (*U. nuda*). The number of fields rejected for seed certification purposes of recent years on account of these diseases has been extraordinarily high; in 1935, for instance, 100 per cent. of the Prins Leopold and 83 per cent. of the Vilmorin 27 wheat plots entered for inspection failed to reach the requisite standard, the corresponding figures for Prins Hendrik, Trifolium, and Robusta, however, being only 0, 4, and 5 per cent., respectively, indicating that the cultivation of resistant varieties is of primary importance. In order to minimize the losses consequent on the rejection of their stands for seed, growers are in the habit of excising the smutted heads prior to inspection, and the advisability of prohibiting this practice as conducive to the spread of infection is under consideration. The occurrence in Holland of physiologic forms of *U. nuda*, characterized by aberrant spore germination of the *U. hordei* type, was conclusively demonstrated in 1936.

BOCKMANN (H.). **Die Getreidefusskrankheiten.** [The cereal foot rots.]—*Forschungsdienst*, ii, 1, pp. 68–71, 1936.

The writer summarizes, with brief critical notes, some of the more important recent literature (from 1922 onwards) on the foot rots of cereals (chiefly *Ophiobolus graminis* and *Cercosporella herpotrichoides*) [*R.A.M.*, xvi, p. 29]. The bibliography comprises 31 titles.

LUDBROOK (W. V.). **Wojnowicia graminis (McAlp.) Sacc. and D. Sacc. in relation to foot rot of Wheat in Australia.**—*Bull. Coun. sci. industr. Res. Aust.* 103, 23 pp., 1936.

In studies conducted from 1933 to 1936 on *Wojnowicia graminis* [*R.A.M.*, xiv, p. 425], widely distributed in wheat-growing areas of Australia and frequently found on wheat plants suffering from foot rot, no important physiological differences were detected in culture between 85 isolates from wheat. The strains could be differentiated into three classes, one containing the majority of isolates and two comprising forms differing more from other groups than those of the same group. Pycnidia were rarely produced in culture except on oat agar. The optimum, maximum, and minimum growth temperatures on potato saccharose agar were 22°, 32°, and under 5° C., respectively. The optimum P_H value was about 7·5.

In parallel inoculation tests on wheat *W. graminis* was decidedly less pathogenic than *Ophiobolus graminis*, *Fusarium culmorum*, or *Helminthosporium sativum*, producing a superficial discoloration of the basal parts of plants grown in infected soil, but apparently exercising no ill effect on growth. Pathogenicity remained practically unaltered even by treatments of the inoculated plants designed to favour attack. No difference in pathogenicity was observed in 50 isolations of the fungus. Concurrent infection with *Urocystis tritici* or *Tilletia tritici* [*T. caries*] did not significantly increase the susceptibility of wheat to *W. graminis*, and the presence of the last-named in the soil did not increase susceptibility to the other two organisms or to *F. culmorum*. The fungus was isolated from 12 species of artificially inoculated grasses and cereals but it was not found more pathogenic to these than to wheat. No appreciable difference in susceptibility was shown by 100 wheat varieties, nor did infection reduce yield.

Under the conditions of the experiments *W. graminis* was only very slightly, if at all, pathogenic to wheat. No evidence was obtained that it is of economic importance in Australia.

SPRAGUE (R.). **Relative susceptibility of certain species of Gramineae to Cercosporella herpotrichoides.**—*J. agric. Res.*, liii, 9, pp. 659–670, 1936.

The author states that during seven years of intensive search in the United States *Cercosporella herpotrichoides* [*R.A.M.*, xvi, p. 30] was only collected on the following wild grasses growing in or at the edge of winter wheat fields severely infected with the fungus, namely, *Agropyron inerme*, *A. riparium*, *Koeleria cristata*, *Bromus tectorum*, *B. inermis*, *B. marginatus*, and *Sitanion hystrix*; typical *Cercosporella* lesions were also observed on *Poa secunda* Presl., but the organism could not be isolated from this host. A tabulated account is given of field and greenhouse experiments, the results of which showed that while under optimum conditions for infection a number of genera and species of grasses were moderately susceptible to *C. herpotrichoides* (species of *Agropyron* being the most susceptible of all the grasses tested), under the semi-arid conditions that prevail in the open these grasses do not become heavily infected with foot rot. There was also evidence that

certain late-maturing varieties of cereals, e.g., Wilhelmina wheat, which appeared to be resistant in the field, did not in reality contain genetic factors for resistance but only escaped infection through their lateness in maturing. Considerable differences in reaction to the fungus were observed in various species of *Aegilops* and *Triticum*, some being markedly resistant and some highly susceptible, indicating the possibility of eventually developing resistant varieties from hybrids between wheat and certain related wild grasses. Evidence is also adduced, indicating that *C. herpotrichoides* has been present for a long time on native grasses in the Columbia basin.

Pronitcheva (Mme L. L.). Фузариоз Пшеницы в Азово-Черноморском крае в **1934** г. и оценка его вредоносности. [Fusariosis of Wheat and determination of its injuriousness in the Azoff-Black Sea region in 1934.]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 129–137, 1936. [English summary.]

The author states that in 1934, evidently owing to exceptionally dry conditions during the spring, wheat crops in the Azoff-Black Sea region suffered heavily from foot rot in the seedling stage; isolations showed 61·7 per cent. of the infection to be due to species of *Fusarium* and 32·5 per cent. to *Helminthosporium sativum*; later the plants suffered from attacks of *Fusarium* spp. on the haulms. The species of *Fusarium* isolated included *F. herbarum*, *F. orthoceras*, *F. scirpi* var. *acuminatum*, and *F. sporotrichioides*; although *F. graminearum* (*Gibberella saubinetii*) [*R.A.M.*, xv, p. 789] was not isolated in pure culture, its abundant occurrence in the region in 1933 makes it highly probable that it was also present in 1934. It was further shown that heavy attacks on the fertile stems reduced the yield in grain by 72·8 to 76·2 per cent., and the specific gravity of the grain by 42·0 to 49·2 per cent. Artificial inoculation of wheat ears with *G. saubinetii* during blossoming reduced the yield by 77·9 per cent. and the specific gravity by 72·4 per cent., while inoculation ten days after the end of blossoming resulted in 43·7 per cent. reduction in yield and 50·9 per cent. reduction in specific gravity.

Special experiments indicated that the intensity of attack by *Fusarium* spp. was significantly reduced by extra early (12th March) sowing of spring wheats, crop rotation, and spring ploughing to a depth of 20 cm. after removal of the turf.

Gorlenko (M. V.). Об источниках инфекции яровых Пшениц бактериозом колосьев. [On the sources of infection of spring Wheats with bacteriosis of the ears.]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 109–114, 1936.

The author established, by preliminary field counts in the Ukraine, that wheat plants (with two to four stems) affected with bacteriosis (*Bacterium translucens* var. *undulosum*) [*R.A.M.*, xvi, p. 91] have from 96 to 100 per cent. of the ears actually infected with the organism. This fact indicates that infection of the plant is systemic and further evidence for this was afforded by experiments in which plants grown from grain collected from diseased Caesium 0111 wheat showed 91·9 per cent. ear infection, as against 35·5 per cent. in plants grown from healthy

seed of the same variety; 46·2 per cent. infection occurred in plants grown from healthy seed on soil to which chaff from diseased grain was added. The presence of the disease in plants raised from healthy seed indicates that secondary infection from neighbouring plants is also extant, but the chief source of infection is undoubtedly the seed from diseased plants. Control measures should, therefore, be directed towards finding an effective means for the disinfection of the seed-grain, and also towards the development of resistant varieties. The possibility of infection being carried in the soil, as indicated by the tests with infected chaff, should also be taken into consideration.

McMillan (J. R. A.). **'Firing'—a heritable character of Wheat.**—*J. Coun. sci. industr. Res. Aust.*, ix, 4, pp. 283–294, 2 pl. [facing p. 316], 1936.

A description is given of an abnormal character of wheat designated 'firing' in which the uppermost laminae begin to die as a whole about flowering time. Death is fairly rapid, but the laminae retain their shape and stiffness for some days. They turn greenish-grey to dull brownish-red, and then to the ordinary straw colour. The sheaths die later, changing immediately to straw colour, and the stems and ears later still. Affected plants usually produce small, stunted ears, flower late, and give shrivelled, viable seed, though some bear no ears. The condition appeared to be due to physiological breakdown, and predisposition to it was found to be inherited. The genetics of the inheritance of the abnormality are discussed.

Jones (G. H.). **Control of Barley diseases. 2. Loose smut and leaf stripe.**—*Bull. Minist. Agric. Egypt*, 167, 21 pp., 11 pl., 1 fig., 2 graphs, 1936.

Barley loose smut (*Ustilago nuda*) is rare on the common native varieties in Egypt, and leaf stripe (*Helminthosporium gramineum*) does not generally cause much loss, but the new varieties originating at Giza have proved more or less susceptible to both diseases. In each case the practical problem of control resolves itself into completely freeing the new varieties from infection without exposing them to germination injury, since very little air-borne infection occurs. Experiments with variations of Jensen's hot water treatment showed that with 4 hours' pre-soak loose smut control increased steadily with duration and temperature of the water (3, 5, and 10 minutes at 50°, 51°, and 52° C.) until complete control resulted with 10 minutes' treatment at 52°. No injury was caused to germination. Leaf stripe was more sensitive to control by heat, complete freedom from infection resulting both from 10 minutes' treatment at 50° and 5 minutes' at 52°. The results obtained were, however, irregular compared with those in the loose smut experiments, the interfering factor probably being secondary infection carried to the treated from the untreated, adjacent plots. Seed treatments were then carried out with a specially designed, small, continuous action, automatic machine [full details of which are given]. This consisted essentially of a circulating water-pervious cloth belt with beaded edges running on the upper course through two slit brass tubes, which guide the belt through a

thermostatically controlled tank; the seed is delivered into the belt which closes at the top to form a tube of 7 in. circumference, the seed at the centre being only 1·1 in. away from the hot water. The temperature of the tank does not vary more than $\frac{1}{2}$° C. and the speed of the belt can be adjusted by altering the size of the driving pulleys. The operator has merely to keep the feed hopper filled with pre-soaked grain and remove the treated seed for drying in the sun. Complete freedom from loose smut without injury to germination resulted from a 4-hour pre-soak in cold water followed by 7$\frac{1}{2}$ minutes' treatment at 56° minimum working temperature, the heat cut-off being arranged at 56·5°. Complete control of wheat loose smut (*U. tritici*) [see above p. 241] without injury to germination was given by identical treatment with the bath at 58°.

MURPHY (H. C.) & LEVINE (M. N.). **A race of crown rust to which the Victoria Oat variety is susceptible.**—*Phytopathology*, xxvi, 11, pp. 1087–1089, 1936.

The physiologic form of crown rust of oats (*Puccinia coronata avenae*) [*P. lolii*] from Texas, to which the Victoria variety (resistant to 37 strains of the fungus) is susceptible [*R.A.M.*, xv, p. 571], is herein designated as No. 41. In reaction tests with the new form on 11 standard differential varieties plus Victoria and Bond at approximately 70° F., Bond and Glabrota remained entirely immune and Ruakura was only mildly attacked, while all the others were more or less severely infected. Bond is known to be susceptible only to forms 33 and 34 of *P. lolii*, additional forms of which will probably be judged solely on the basis of their reaction to this variety and Victoria; these two varieties were therefore included in the test, even though the 41 races may be identified by using the 11 standard varieties only. Under present conditions, for every known parasitic race of rust or smut attacking oats, an immune variety has also been recognized, and as long as this situation continues the outlook for breeding for resistance may be considered promising.

KOTTE (W.). **Pflanzenschutz im Maisbau.** [Plant protection in Maize cultivation.]—*Kranke Pflanze*, xiii, 11, pp. 193–196, 1 pl., 1936.

Maize smut (*Ustilago zeae*) is stated to be practically co-extensive with the cultivation of the crop in south Germany [*R.A.M.*, xii, p. 88], but it may be effectively combated by strict observance of the following simple measures: crop rotation, avoidance of fresh stable manure and sparing use of liquid manure, and rigorous elimination of the first smut balls, which should be burnt or deeply buried.

HOPPE (P. E.). **Intraspecific and interspecific aversion in Diplodia.**—*J. agric. Res.*, liii, 9, pp. 671–680, 2 figs., 1936.

The author states that in the course of his cultural studies of *Diplodia zeae* [*R.A.M.*, xv, p. 793] he observed phenomena of aversion [cf. ibid., xiv, p. 645], manifested most frequently by an antagonistic reaction between adjacent colonies, in which growth at the advancing margins

ceased and was apparently followed by a dying-back of the mycelia, resulting in a darkening of the agar between the colonies. In other cases, however, the advancing hyphae of the different colonies intermingled freely, with a piling up or 'drifting' of the mycelium at the line of juncture. It is believed that aversion in *D. zeae* results from the interaction between two physiologically different strains, the number of which is apparently very large, since 21 strains were obtained from 25 cultures isolated from as many ears of maize from one field, and 25 isolates from widely separated points throughout the maize belt of the United States gave 24 different strains. The particular aversion reactions of the strains which were studied remained stable, after successive mycelial propagations, through three successive pycnidial generations in pure culture, and also through inoculation into maize cobs and subsequent reisolation. Aversion also occurred between colonies of *D. zeae* and of *D. macrospora* [ibid., xiv, p. 564].

Field experiments in 1934 and 1935 at Madison, Wisconsin, in which plants of three inbred maize lines were inoculated with various combinations of three strains of *D. zeae* and a strain of *D. macrospora*, showed that usually one strain exerted an inhibitory effect on the others, so that it alone was re-isolated from ears inoculated with a mixture; there was evidence of a definite sequence in the inhibitory powers of strains upon one another and, so far as tried, *D. zeae* predominated over *D. macrospora*.

Takasugi (H.) & Akaishi (Y.). **Studies on the downy mildew of Millet in Manchukuo (second report). About the infection power of oospores.**—*Res. Bull. S. Manchuria Rly Co.* 15, pp. 13–57, 3 pl., 5 graphs, 1935. [Received December, 1936. Japanese, with English summary.]

The oospores of downy mildew (*Sclerospora graminicola*) of Italian millet [*Setaria italica*] in Manchukuo were first detected on the infected organs some 80 days after sowing the crop [*R.A.M.*, xiv, p. 577]. Inoculation experiments with the oospores gave 40 to 100 per cent. positive results. When these bodies were sprinkled with water and maintained at a temperature of 31° C., the growth rate of the germ-tubes exceeded 500 μ in five days.

In a test to determine the infective capacity of the oospores in soil at varying distances from the seeds, no infection developed beyond 5 cm. when both were on the same level, while the corresponding limits when the oospores were above or below the seeds were 8 and 4 cm., respectively.

When kept in a dry state the viability of the oospores persisted for eight years. Experiments on the germinative and infective capacities of the oospores after overwintering under various conditions showed an inverse relationship between soil depth and virulence. Cultural factors predisposing the crop to infection by *S. graminicola* included thickness of the soil layers covering the seed and omission of potash and phosphoric acid from the fertilizer scheme. Of the 83 varieties of *Setaria italica* tested for their reaction to downy mildew, 19 proved comparatively resistant. Among the more effective methods of seed treatment was immersion in formalin.

WANG (C. S.). **Viability and longevity of chlamydospores of Ustilago crameri.**—*Phytopathology*, xxvi, 11, pp. 1086–1087, 1936.

Chlamydospores of *Ustilago crameri* (the agent of millet [*Setaria italica*] smut [*R.A.M.*, xvi, p. 159]) were taken from sori of various ages from emergence to maturity of the host and tested for germinability in water and a 2 per cent. sugar solution. A considerable number germinated without any resting period, physiological maturity evidently being reached before morphological completion. A fairly high percentage of spores stored at 7° to 9°, 16° to 20°, and 20° to 25° C. maintained their viability for three years in the writer's tests, while about 1 per cent. of material from Rabenhorst's Fungi Europaei Cent. xix, published 1874, was also found to be germinable. Actually this collection appears to date from 1872, so that a period of viability of 64 years for the chlamydospores of *U. crameri* is indicated.

SAWADA (K.). **Studies on the development and propagation of Phoma citricarpa McAlpine.**—Reprinted from *J. Formosan Agric.*, *1935*, 7–8, 31 pp., 1 pl., 1 fig., 1935. [Japanese. Abs. in *Jap. J. Bot.*, viii, 3, p. (77), 1936.]

In the author's pure cultures of *Phoma citricarpa*, the agent of a yellowish to dark brownish, concave spotting of growing or stored oranges [*R.A.M.*, xv, p. 281] in Japan, the conidia were observed to be furnished with a white mucilage facilitating their adhesion to the fruit. They failed to germinate either in distilled, tap, or sugar water, but did so in orange juice and citric (0·1 to 0·3 per cent.) or tartaric acids. Sporulation in *P. citricarpa* occurs most freely at about 25° C. Wounds inflicted on the surface of the fruit by the insect *Rhynchocoris humeralis* appear to constitute the principal channels of entry of the fungus.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas. (Fortsetzung.)** [Coffee pests and diseases in Africa. (Continuation).]—*Tropenpflanzer*, xxxix, 11, pp. 455–481, 17 figs., 1936.

In this continuation of the writer's survey of coffee pests and diseases in Africa [*R.A.M.*, xv, p. 798] brief notes are given on diseases caused by *Colletotrichum coffeanum*, *Cercospora coffeicola*, *Trachysphaera fructigena* [ibid., xiv, p. 154], koleroga disease [*Corticium koleroga*: loc. cit.], *Botrytis* rot of coffee cherries [ibid., x, p. 297], and coffee cherry fall [ibid., xiii, p. 114].

ANDREWS (F. W.). **Investigations on black-arm disease of Cotton under field conditions. I. The relation of the incidence and spread of black-arm disease of Cotton to cultural conditions and rainfall in the Anglo-Egyptian Sudan.**—*Emp. J. exp. Agric.*, iv, 16, pp. 344–356, 1 fig., 6 graphs, 1936.

Detailed observations on the incidence and spread of blackarm (*Pseudomonas* [*Bacterium*] *malvacearum*) in 51 native 10-acre plots in the Gezira area of the Sudan in 1932–3 [*R.A.M.*, xiii, p. 696] showed

that most infection occurred in the earliest sown crop. Out of 19 selected plots 14 showed most infection on the side nearest the old cotton land, and 5 an irregular distribution of infection probably due to the scattering of wind-blown infective debris on the new land before sowing [ibid., xvi, p. 173]. Most of the outbreaks (the first symptoms of which became apparent 12 to 14 days after initial infection) were associated with rainfall on particular dates. It was found that rate of spread depends on the frequency and severity of the rains.

Observations on 16 plots in 1933–4 in a badly infected area gave striking evidence of decrease in infection with increasingly late sowing, there being an evident relationship between the amount of infection and diminishing rainfall. Apparently, the cotyledons and leaves first become susceptible when the plants are about 11 and not under 9 days old. A correlation was also noted between rapid increase in incidence and the occurrence of driving rains. Out of 15 plots adjacent to the previous year's cotton land, 10 showed initial infection on the side nearest the old land, and in only one of these did the earliest sowing occur on that side.

It is concluded that infective debris on adjacent cotton land of the previous season is the main cause of an outbreak of blackarm in the new crop and when this source of infection is present sowing date is a major factor governing the earliness of an outbreak. The severity and frequency of driving rains are also an important factor in determining the final severity of the disease. The only effective means of control is to remove or render innocuous infective material remaining on old land.

TENNYSON (GERTRUDE). **Invasion of Cotton seed by Bacterium malvacearum.**—*Phytopathology*, xxvi, 11, pp. 1083–1084, 1 fig., 1936.

Under favourable conditions of moisture 20 per cent. or more of cotton seedlings become infected with *Bacterium malvacearum* [see preceding and next abstracts] as a result of internal contamination of the seed. Evidence is briefly adduced from laboratory tests to show that the organism can enter untreated and delinted cotton seed through the basal cap in the presence of water. The cap is composed of pigment-bearing cells with large intercellular spaces and sections of inoculated seed showed the bacteria beneath the basal cap and in the spaces. Under natural conditions innumerable bacteria are washed to the ground from the infected foliage and remain suspended in the run-off water between the rows of cotton, where they can maintain their viability for 44 to 56 hours [*R.A.M.*, xv, p. 214]. The seed of open bolls soaked in bacterium-laden water has been experimentally shown to carry both internal and external contamination. On entering the mature seed the organisms apparently become inactive and remain so until germination commences. The basal cap, adhering to the cotyledons, is carried upwards as the plant emerges from the soil. The soil water may convey the bacteria to the seed leaves and hypocotyl, or they may be washed by rain or dew on to the leaves and stems, thus inducing primary seedling infection.

MEISSAKHOVITCH (J. A.) & MEDVEDEFF (I. D.). Механизация протравливания семян Хлопчатника формалином. [Mechanization of Cotton seed disinfection with formalin.]—*Mechanization of Plant Protection, Bull. Pl. Prot. Leningr., Ser. III (Control measures and implements), 1936*, 8, pp. 77–88, 2 figs., 1936.

A tabulated account is given of preliminary tests in 1935, the results of which showed that cotton seed disinfection by formalin [against blackarm (*Bacterium malvacearum*): *R.A.M.*, xvi, p. 172] can be satisfactorily and economically effected with Heid's cereal seed disinfecting apparatus, with some technical modifications in its construction. The seed is fed by a hopper into a tank containing formalin, from which it is raised by means of an Archimedean screw, rotating in a galvanized iron cylinder, inclined at an angle of 35°. The tests showed that three workers can disinfect up to 1,050 kg. cotton seed per hour with the help of this hand-driven apparatus, and that if the working of the machine could be made continuous its output could be brought up to 1,460 kg. seed per hour.

SAREJANNI (J. A.) & CORTZAS (C. B.). **La nature de la résistance du Coton au Macrophomina phaseoli (Maubl.) Ashby.** [The nature of the resistance of Cotton to *Macrophomina phaseoli* (Maubl.) Ashby.]—Reprinted from *C.R. IIIième Congr. int. Path. comp.*, 4 pp., 1936.

To ascertain whether the susceptibility of the Greek cotton variety 'Dodiotico' (*Gossypium herbaceum*) to *Macrophomina phaseoli* and the resistance of American varieties of the same fungus [*R.A.M.*, xv, p. 577] are due to different anatomical characters the authors made a histological examination of the tap-roots of pot seedlings of the different cottons grown in Greece. These showed that in Dodiotico cotton the cortical phelloderm of the tap-root consists of 5 to 8 layers of nearly square cells averaging 25 to 28 by 15 to 25 μ, while in the King, Acala, Trice, and Ingold varieties it consists of 8 to 12, 10 to 12, 10 to 15, and 22 layers, respectively, of rectangular cells measuring 50 to 72 by 25 to 30 μ. Further, the suberized membrane averaged 1·5, 2·5, and 4·5 μ thick in the Dodiotico, Acala, and King varieties, respectively.

The available evidence indicates that the fungus effects entry through cracks in the phelloderm. Observation showed that most infection occurs locally in argillaceous soils which crack during hot weather and cause injuries to the Dodiotico roots. The phelloderm of the American cottons being stronger, these are naturally less susceptible.

TAUBENHAUS (J. J.) & CHRISTENSON (L. D.). **Role of insects in the distribution of Cotton wilt caused by Fusarium vasinfectum.**—*J. agric. Res.*, liii, 9, pp. 703–712, 1 fig., 1936.

This is a full report [an abstract from which has already been noticed from another source: *R.A.M.*, xiii, p. 766] of the authors' experiments, in which a species of *Fusarium* similar to or identical with *F. vasinfectum* was obtained in pure culture from the faecal pellets of a number of phytophagous insects or their larvae (including *Alabama argillacea*, *Laphygma frugiperda*, *Prodenia ornithogalli*) which had been

fed in cages on wilt-infected cotton plant tissues. Successful inoculation of cotton seedlings was obtained with the strains of *Fusarium* thus recovered. Passage through wireworms, Collembola, and Japygidae, however, was fatal to the fungus.

The work established that the following insects act as natural carriers of *F. vasinfectum* in Texas, namely, *Melanoplus differentialis*, *M. mexicanus*, *M. femur-rubrum*, *Encoptolophus texensis*, *Spharagemon cristatum*, *Tomonotus aztecus*, *Chortophaga viridifasciata* var. *australior*, *Schistocerca americana*, *S. obscura*, *Trimerotropis citrina*, and *Dissosteira carolina*.

While it was shown that *F. vasinfectum* survived for 15 months in faecal pellets from grasshoppers kept dry in the laboratory, its passage through the alimentary tract of the insects studied is relatively rapid (not over 45 minutes), so that while swiftly flying insects could undoubtedly spread the fungus from field to field through their faecal pellets, the supply of fungus contained by them would be exhausted before they covered any great distance. The boll weevil (*Anthonomis grandis*), *Nezara viridula*, and other insects, however, were found to be capable of transporting viable spores of *F. vasinfectum* on the surface of their bodies, and this fact opens unlimited possibilities for the spread of cotton wilt.

Petch (T.). **Cordyceps militaris and Isaria farinosa.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 216–224, 1936.

After referring to Tulasne's opinion, expressed in 1857, that *Isaria farinosa* was the conidial stage of *Cordyceps militaris* [*R.A.M.*, xv, p. 801], the author gives a short historical survey of the work done on this point by De Bary, G. F. Atkinson, and R. H. Pettit, and describes his own data from which he concludes that the conidial stage of *C. militaris* is a *Cephalosporium* occurring on the mycelium on the larva or pupa bearing the *Cordyceps*. It has not been known to produce an *Isaria* form in nature or culture. *I. farinosa* is a fasciculate *Spicaria*, and may occur as an *Isaria* or a simple *Spicaria*. No perithecial stage is known and it has no relation to *C. militaris*. Furthermore *C. militaris* attacks the larvae and pupae of Lepidoptera (the two records on Coleoptera are probably erroneous), whereas *I. farinosa* occurs on Lepidoptera, Hymenoptera, Coleoptera, Diptera, Aphides, and Arachnida. The *C. militaris* of the United States is the same as the European species.

Fresa (R.). **Enfermedades de la Langosta, Sporotrichum paranense March., Coccobacillus acridiorum d'Hér.** [Locust diseases, *Sporotrichum paranense* March., *Coccobacillus acridiorum* d'Hér.]—*Mem. Com. centr. Invest. Langosta 1934, Min. Agric. nac. B. Aires*, pp. 97–102, 2 pl., 2 graphs, 1936.

The green fungal parasite, *Sporotrichum paranense*, of Argentine locusts [*Schistocerca paranensis*: *R.A.M.*, xv, p. 216] was successfully cultured on a medium of wheat grains in flasks in a water bath at a temperature of 25° to 30° C., and field experiments were conducted in the dissemination of the fungus by (*a*) the establishment of infection foci and (*b*) spraying and dusting the insects. The former method gave

negative results, while the latter, though affording promising indications of practical utility, requires further extensive testing to determine its value on an agricultural scale. Fifty caged locusts kept for comparison in the above-mentioned tests died of a disease believed to have been due to *Coccobacillus acridiorum* [ibid., xiii, p. 439].

MOORE (M.) & DE ALMEIDA (F. P.). **New organisms of chromomycosis.** —*Ann. Mo. bot. Gdn*, xxiii, 4, pp. 543–552, 1 pl., 1936.

English and Latin diagnoses are given of the fungi causing chromomycosis in North and South America [*R.A.M.*, xv, p. 720; xvi, p. 38].

Phialophora macrospora n.sp. [loc. cit.] differs from *P. verrucosa* in its spores and spore-bearing 'cups'. The spores measure up to 7 μ in diameter when spherical, and 3 to 7 by 2 to 4 μ when ellipsoid, and the spore-bearing 'cups' are 2 to 7 (chiefly 4 to 5) μ in diameter at the lips. The oidioid cells are approximately 5 μ in diameter, and the spherical cells (on Loeffler's agar) 6 to 14 (usually 12) μ in diameter. The colonies are greyish-brown or olivaceous-green to black.

Botrytoides n.gen. simulates *Botrytis* morphologically, but differs in the blue-black colour of the culture. The repent, branched, septate hyphae are submerged on most media. The simple, branched or proliferating, brown conidiophores have simple, irregular tips due to small 'sterigmata', left after the conidia have fallen off. The fusiform to short-cylindric, brown or subhyaline conidia are borne close together at the tip of the conidiophore. The type species, *B. monophora* n.sp., forms dark, greenish-grey, or olivaceous-green to black colonies with a brown or purple tinge and single or multicellular, lateral or terminal conidiophores. The ovoid, ellipsoid, or subfusiform spores measure 2 to 8 by $1\frac{1}{2}$ to 5 μ, and are arranged along the conidiophore or in head formation.

Hormodendroides n.gen. has a black, septate, branched mycelium with simple conidiophores bearing several fusiform to short-cylindric conidia attached to the terminal portion, or conidiophores of the *Hormodendrum* type with subspherical or ellipsoid spores, catenulate in acrogenous branches. *H. pedrosoi* [ibid., xvi, p. 99] is transferred to the genus as *Hormodendroides pedrosoi* (Brumpt) Moore & Almeida n.comb., and constitutes its type species.

Phialoconidiophora n.gen. differs from *Phialophora* by the presence of three types of conidiophores: (*a*) dendroid, branching conidiophores of the *Hormodendrum* type, with cupuliform spore-bearers at the apices or laterally, (*b*) of the *Botrytoides* type, and (*c*) cupuliform spore-bearers of the *Phialophora* type. Chlamydospores are present. Spores from the 'cups' are globoid to ovoid, hyaline to subhyaline, those from the *Botrytoides* type of conidiophores are ovoid, ellipsoid, or subfusiform, and those from the *Hormodendrum* type are subspherical or ovoid and catenulate in acrogenous branches.

In *Phialoconidiophora guggenheimia* n.sp. the cultures are olivaceous-green or greyish-black, tinged with purple or black. The hyphae bear conidia 3 to 8 by $1\frac{1}{2}$ to $4\frac{1}{2}$ μ, either sessile, single, and isolated or on conidiophores of the *Botrytoides* type. The conidiophores of the *Hormodendrum* type bear several phialides, approximately 4 to 10 by 2 to 4 μ, and conidia 3 to 8 by $1\frac{1}{2}$ to $4\frac{1}{2}$ μ. The phialae measure 2 to 6 μ

in diameter at the lips, and are borne on specialized branches or develop directly from hyphae or on stalks. The mostly hyaline spores measure 1 to 3 μ in diameter when globoid, and 2 to 4 by 1 to $2\frac{1}{2}$ μ when ovoid. The thick-walled, single or multilocular chlamydospores measure approximately 3 to 16 by 3 to 16 μ.

P. compactum n.comb., to which *H. compactum* [ibid., xv, p. 804] is transferred, has predominantly the *Hormodendrum* type of sporulation, rarely the *Phialophora* type. In the former, the subspherical, smooth, olivaceous conidia borne in short branching chains in compact groups at the tip of the conidiophores measure 2·5 to 4·8 by 2·5 to 3·8 μ. The conidiophores of the latter type measure 7 to 12 by 3 to 4 μ and the oval, smooth, thin-walled, light green conidia 2 to 3 by 1·5 to 2 μ.

Moore (M.). **Mycologic technique in dermatologic practice.**—*Arch. Derm. Syph., Chicago*, xxxiv, 4, pp. 880–886, 1936.

A description is given of an effective technique for use in routine laboratory work on cases of suspected mycosis. Scrapings from the lesions (preferably the borders) should be mounted in potassium or sodium hydroxide (10 to 30 per cent.). Stains (e.g., cotton blue) may be used to advantage on thin material, and India ink for the examination of specimens suspected of infection by blastomycosis or torulosis. The most widely used medium for the cultivation of human pathogenic fungi is a modification of Sabouraud's original formula consisting of 10 gm. peptone, 40 gm. dextrose, 15 gm. agar, and 1,000 c.c. tap or distilled water, with a P_H value of 5·2 to 5·6. If the organism is to be preserved for teaching or comparative purposes, it should be grown on the so-called 'conservation agar': 30 gm. peptone, 15 gm. agar, and 1,000 c.c. water, the omission of the carbohydrate from which precludes morphological changes. A very useful medium for yeast isolations consists of 12·75 gm. maltose, 15 gm. each malt extract and agar, 2·75 gm. dextrin, 2·35 gm. glycerine, 1 gm. each dipotassium phosphate and ammonium chloride, and 0·78 gm. peptone (P_H 4·7). For liquid media (used in drop cultures) the following are recommended: nutrient broth, liquid wort, Sabouraud's minus the agar, 2 per cent. peptone, and 2 per cent. peptone plus 2 per cent. dextrose.

Peyri (A.) & Casanovas (M.). **Observaciones sobre dos casos excepcionales de favus.** [Observations on two uncommon cases of favus.] —*Rev. méd. Barcelona*, xxv, 147, pp. 266–268, 2 figs., 1936.

Clinical details are given of two cases of favus due to *Achorion schoenleini*, one in a 28-year-old male and the other in a female infant, to which a certain interest attaches by reason of the unusual site involved in the former and of the extremely early age (six days) of the patient in the latter.

Milian [G.] & Karachentzeff. **Epidémie de trichophytie epidermique due au 'Microsporon felineum' chez 10 personnes. Extension au cuir chevelu chez deux enfants.** [An epidemic of epidermal trichophytosis due to *Microsporon felineum* among 10 persons, with extension to the scalp in two children.]—*Bull. Soc. franç. Derm. Syph., 1936 (II)*, 5, pp. 1621–1622, 1936.

Details are given of ten cases of epidermomycosis in females of neigh-

bouring families ranging from 6 to 82 years of age, with extension to the scalp in the case of the two children involved. Cultures from the squamae and hairs consistently yielded *Microsporon felineum* [*R.A.M.*, xv, p. 721; xvi, p. 101], accompanied in a few instances by *Penicillium*, *Trichothecium roseum* [ibid., x. p. 731], and *Haplographium de bellae marengoi* [ibid., xv, p. 220].

OBRTEL (J.). **Výsledky mykologického vyšetřování na česke kožní klinice v Praze v r. 1934.** [The results of mycological studies at the Czech Skin Clinic in Prague in 1934.]—*Čes. Derm.*, xvi, 4, pp. 104–110, 1 pl., 1936. [Abs. in *Zbl. Bakt.*, Abt. 1 (*Ref.*), cxxiv, 5–6, p. 133, 1936.]

Of the 50 cases of skin disease of fungal origin (confirmed by culture) investigated at the Prague Skin Clinic in 1934, 11 were due to *Microsporon audouini* [*R.A.M.*, xv, p. 721], 3 to *Trichophyton violaceum* [ibid., xvi, p. 179], 10 to *T. gypseum asteroides* [*T. mentagrophytes*: ibid., xvi, p. 101], 5 to *Achorion schoenleini*, 2 to *A. violaceum* [ibid., xv, p. 151], 4 to *Monilia* [*Candida*], 7 to *Epidermophyton inguinale* [*E. floccosum*: ibid., xv, p. 580], 5 to *E.* [*T.*] *interdigitale* [ibid., xvi, p. 178] and 3 to *T. rubrum*. The last-named made the most interesting study, causing a typical disorder to which the name of 'eczema serpiginosum epidermophyticum' is applied [ibid., xv, p. 438].

HOWLES (J. K.). **Infectious intertrigo.**—*Amer. J. trop. Med.*, xvi, 1, pp. 77–90, 3 graphs, 1936.

Ten per cent. of the 600 cultures examined mycologically from scrapings of infectious intertrigo in a survey of nearly 3,000 cases among adult males in an American prison yielded pathogenic fungi in the following proportions: *Epidermophyton* [*Trichophyton*] *interdigitale* [see preceding abstract] 32, *E. inguinale* [*E. floccosum*: loc. cit.] 17, *E.* [*T.*] *rubrum* [loc. cit.] 4, *E.* [*T.*] *gypseum* [*R.A.M.*, xvi, p. 179] 3, and unclassified 4. Attention is drawn to the extreme variability of the clinical manifestations induced by these dermatophytes, corresponding to their pleomorphism in culture. Some details are given of the therapeutic measures adopted against the condition.

LAWLESS (T. K.). **Tinea sycosis of the upper lip.**—*Arch. Derm. Syph., Chicago*, xxxiv, 1, pp. 118–121, 3 figs., 1936.

From the upper lip of a 50-year-old man the writer isolated a fungus characterized in pure culture on maltose agar by a smooth, round central cupula with radiations resembling the spokes of a wheel and alternating thick and thin, centrifugal zones, of which the outermost was fine, smooth, and lace-like, the remainder of the growth being coarse and pale yellow. Pluriseptate spindles and aleuriospores were observed. On the basis of these features the organism was identified as *Trichophyton gypseum* [see preceding abstract].

FISHER (VIRGINIA). **Diseases of the mouth due to fungi.**—*J. Amer. dent Ass.*, xxiii, 9, pp. 1665–1671, 1936.

This is a concise survey of some outstanding contributions to the knowledge of fungal diseases of the mouth, including thrush, perlèche,

and glossitis associated with *Monilia* [*Candida*] *albicans* [*R.A.M.*, xvi, p. 178], sporotrichosis (*Sporotrichum schenckii*) [ibid., xv, p. 361], stated to be particularly widespread in the Mississippi Valley, blastomycosis (*Blastomyces* [*Endomyces*] *dermatitidis*) [ibid., xvi, p. 100], and coccidioidal granuloma (*Coccidioides immitis*) [ibid., xv, p. 503].

BERGHAUSEN (O.). **Moniliosis of the respiratory and digestive tracts.**—*Amer. J. digest. Dis.*, iii, 4, pp. 271–272, 1936.

Clinical particulars are given of three cases of mycotic infection involving the respiratory and digestive tracts, of which two were shown by pure culture studies to be due to *Monilia* [*Candida*] *albicans* [see preceding abstract] and the third to *Torula histolytica* [*Torulopsis neoformans* or *Cryptococcus hominis*: *R.A.M.*, xv, p. 802], the last-named entering the system through an injury to the tongue.

OYAMA (T.). **Kasuistischer Beitrag zur Sporotrichose.** [An etiological contribution to sporotrichosis.]—*Hihu-to-Hitunyo, Hukuoka*, iv, pp. 140–148, 1936. [Abs. in *Zbl. Bakt.*, Abt. 1 (*Ref.*), cxxiv, 5–6, pp. 139–140, 1936.]

Sporotrichum beurmanni [*R.A.M.*, xv, p. 482], isolated from the dorsal surface of the left hand and from the left forearm, made good growth both on Sabouraud's glucose and honey agars, forming ivory-coloured, later brown colonies with cerebroid convolutions in the centre; the brown pigmentation was absent on sugar-free media. Acid was evolved from a number of sugars, but no gas; gelatine was not liquefied; litmus milk was tinged faintly reddish. The fungus was pathogenic to mice and rabbits in laboratory experiments.

BRIERLEY (P.) & MCWHORTER (F. P.). **A mosaic disease of Iris.**—*J. agric. Res.*, liii, 8, pp. 621–635, 4 figs., 1936.

This is a full account of the authors' studies of the mosaic disease of bulbous irises in the United States, a preliminary abstract of which has been noticed from another source [*R.A.M.*, xiii, p. 380]. The commercial importance of the disease which, as early as 1928, was widely distributed in Washington, Oregon, and California, lies chiefly in the dwarfing effect, resulting in a shorter flower stalk for cut blooms, and in a lower rate of increase in planting stock. Histological examination showed that in mosaic-affected leaves the epidermal cells are smaller than normal, and sometimes contain X bodies of a vacuolate or reticulate type [ibid., xi, p. 796]. In the flecked areas of flowers affected with mosaic the number of plastids is reduced. Of the aphids tested, only *Illinoia solanifolii* [*Macrosiphum gei*] and *Myzus persicae* were shown to be able to transmit the virus; three stocks of the first gave 32, 6, and 45 per cent. infection, and two stocks of the latter gave 76 and 31 per cent. infection, respectively. No transmission was effected by aphids transferred by means of a camel's hair brush, owing to injury to the mouth parts [ibid., xiii, p. 331]. Cross inoculations between different coloured varieties of the bulbous irises and between varieties of the Dutch and Spanish varieties (derived from *Iris xiphium* and *I. xiphium praecox*, respectively) were readily successful, and the disease was also transmitted to bulbous irises from naturally infected *I. ricardi*, *I.*

unguicularis var. *alba*, and from the bearded iris William Mohr. Consistently negative results were obtained in attempts to transmit the iris mosaic to tobacco, tomato, petunia, and tulip, and also to infect iris with mosaic from lily and tulip.

BURT (CATHERINE C.). **A leaf-spot disease of Sweet William caused by Heterosporium echinulatum.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 207–215, 3 figs., 1936.

On sweet william (*Dianthus barbatus*) leaves heavily infected with *Heterosporium echinulatum* received at the Scottish Plant Pathological Laboratory in May, 1932, the presence of small, black perithecia with mature asci was observed. Ascospores in hanging drop culture gave rise to typical *H. echinulatum* conidia and thereby established the relationship of the two stages. Single ascospores on malt extract agar formed a dome-shaped growth, white above and olive-green beneath, and produced the conidial stage in 4 to 5 weeks when the colony was about 1 to $1\frac{1}{4}$ in. in diameter. Single conidia isolated from the original mycelium gave rise to two types of culture, one of which (A) was exactly similar to that from single ascospores, while the other (B) differed in that the conidia developed in 4 to 10 days. When conidia of type A were produced the surface of the culture became greyish-green, whereas with type B it was olive-green. Conidia from the two types were repeatedly reisolated and replanted, but the distinction persisted on malt agar, though on sterilized carnation and sweet william leaves conidia were produced freely by both A and B types after 10 to 12 days. There was marked variation in size between conidia from different cultures on the same medium, and also between those on different media.

Conidia were placed on sterilized sweet william leaves on 6th December, 1932 and these, transferred to the greenhouse on 10th January, 1933, showed perithecia with asci in May, 1933. The black, irregularly spherical perithecia measure 100 to 270 μ in diameter and are provided with stout beaks, 10 to 30 μ long. Only about 10 per cent. contained asci, but under moist conditions many of the sterile ones developed tufts of conidiophores from the beaks, the conidia exactly resembling those of *H. echinulatum*. Each fertile perithecium contained 8 to 18 fascicled, thin-walled, hyaline, very irregularly shaped asci attached by short pedicels to a basal mass of pseudoparenchyma. Paraphyses were absent. The apex of the ascus was thickened up to 10 μ. Most of the asci contained 8 torpedo-shaped, thin-walled, colourless ascospores measuring 22 to 31 by 7 to 9 μ unequally divided by a transverse septum into an upper cell 1 to 6 (average 3·3) μ long, and a longer, narrower basal cell, with a slight constriction at the septum. The perfect stage is named *Didymellina dianthi* n.sp., with a Latin diagnosis.

In artificial infection experiments sweet william plants were highly susceptible, and pinks and carnations (well-known hosts of the fungus) very resistant, indicating that specialized races of the fungus are present on different hosts.

FIKRY (A.). **Diseases of Phlox and Antirrhinum.**—*Leafl. Minist. Agric. Egypt*, 76, 6 pp., 5 pl. [2 col.], 1936.

Phlox in Egypt is attacked by powdery mildew (*Erysiphe cichora-*

cearum) and leaf spot (*Septoria phlogis*) [*R.A.M.*, xv, p. 25]. The former spreads rapidly in humid weather, and causes a yellowing and falling of the leaves. The latter appears as small brownish spots which may enlarge and coalesce. Heavy infection of mildew may generally be avoided by late sowing, and against both diseases dusting with sulphur every fortnight, or spraying with bouisol are recommended.

Antirrhinum [*majus*] wilt (*Fusarium solani* var. *martii*) kills off both seedlings and mature plants, and is destructive in plants grown in the same beds for many successive years. Mature plants may either wilt suddenly or turn yellow and then wilt, or they may die prematurely without wilting. Control consists in the use of resistant varieties (e.g., Queen Victoria White, Intermediate Yellow, Coral Red and White, Very Dark Crimson, and Rose Suffused Salmon).

In a mimeographed addendum it is stated that a very severe outbreak of antirrhinum rust (*Puccinia antirrhini*) [ibid., xv, p. 655] occurred in Egypt in 1936.

RIKER (REGINA S.). **Fusarium lateritium v. fructigenum in relation to wilt of China Aster.**—*Phytopathology*, xxvi, 11, pp. 1085–1086, 1936.

A culture of *Fusarium lateritium* var. *fructigenum* [*F. lateritium*] from Germany, identified by H. W. Wollenweber and numbered 4221, was inoculated into China asters (*Callistephus chinensis*) in Wisconsin with positive results in 1930 and 1932 [*R.A.M.*, xv, p. 24], the varieties resistant and susceptible, respectively, to *F. conglutinans* var. *callistephi* [ibid., xv, p. 808] behaving similarly in respect of the German organism. Recent examinations by W. C. Snyder and Wollenweber of cultures of 4221 both in the United States and in Germany indicate that the original strain from the latter country was a mixture of *F. lateritium* and *F. conglutinans* var. *callistephi*, of which the latter was probably responsible for the symptoms of *C. chinensis* induced by inoculation with 4221.

DODGE (B. O.). **Marigold wilt.**—*J. N.Y. bot. Gdn*, xxxvii, 441, pp. 211–214, 2 figs., 1936.

An undetermined species of *Fusarium* with flesh-coloured conidia is suspected to be the agent of a wilt of African marigolds (*Tagetes erecta*) and certain dwarf types (*T. patula* and *T. signata pumila*) at the New York Botanical Garden, a *Verticillium* at the base of dying plants being apparently secondary. In general, the symptoms of the affected marigolds resemble those of asters [*Callistephus chinensis*] suffering from wilt [*F. conglutinans* var. *callistephi*: see preceding abstract], but it is not yet certain that the causal organisms are identical. The marigold *Fusarium* overwinters in the soil, sterilization of which should, therefore, be effected by the incorporation with the thoroughly pulverized soil of $\frac{1}{2}$ gall. 1 in 50 formaldehyde per sq. ft. or by modifications of this treatment to suit individual environments.

ARK (P. A.) & GARDNER (M. W.). **Bacterial leaf spot of Primula.**—*Phytopathology*, xxvi, 11, pp. 1050–1055, 1 fig., 1936.

Phytomonas primulae n.sp., the agent of a leaf disease of *Primula*,

especially *P. polyantha* Mill. [*P. elatior* Hill], in the San Francisco Bay region of California, manifested by irregularly circular, brown, yellow-bordered lesions, up to 8 mm. in diameter, sometimes coalescing, is a motile, uniflagellate rod, 1 to 3·16 by 0·51 to 0·73 μ, staining readily with carbol fuchsin, methylene blue, and gentian violet, but Gram-negative. It is a facultative anaerobe, forming neither spores nor capsules, producing on beef-peptone agar smooth, round, glistening colonies, with a greenish pigment on this and other media. Gelatine is liquefied, milk coagulated, and ammonia is produced but neither indol nor hydrogen sulphide; nitrates are not reduced and no diastatic action is exerted on starch. Acid is evolved without gas from dextrose, lactose, sucrose, maltose, galactose, arabinose, glycerine, dulcite, and mannitol. The minimum, optimum, and maximum growth temperatures are 10°, 19° to 22°, and 34° C., respectively. The bacterium is very sensitive to desiccation, surviving only one hour's drying. Inoculations of healthy plants by atomizing with a suspension of the organism resulted in the development of conspicuous lesions in two to four weeks on the leaves only. Twenty-one of the 27 species of *Primula* inoculated proved susceptible, but *P. japonica*, *P. littoniana*, *P. microdonta*, *P. rosea* var. *grandiflora*, *P. sibirica*, and *P. viali* reacted negatively to infection.

NICOLAS (G.). **Observations sur Puccinia mirabilissima Peck. Sa présence dans la région toulousaine.** [Observations on *Puccinia mirabilissima* Peck. Its presence in the neighbourhood of Toulouse.] —*Bull. Soc. mycol. Fr.*, lii, 2, pp. 239–248, 1936.

In June, 1935, and February, 1936, the author observed uredospores and teleutospores of *Puccinia mirabilissima* [*Cumminsiella sanguinea*: *R.A.M.*, xv, p. 372] on the leaves of *Mahonia* [*Berberis*] *aquifolium* near Toulouse. The fungus differs from *Uropyxis* in the fact that the aecidia are surrounded by a peridium of the *Puccinia* type and from the *Raveneliae* [including *Cumminsiella*] in its isolated, free teleutospores. It has all the characters of a *Puccinia* except that according to Magnus it shows the presence of two or more germinative pores in each cell of the teleutospore.

PRETI (G.). **Un' infezione di 'Pythium' su piante di 'Phyllocactus phyllanthoides'.** [A *Pythium* infection on *Phyllocactus phyllanthoides* plants.]—*Riv. Pat. veg.*, xxvi, 9–10, pp. 331–353, 13 figs., 1936.

In July, 1936, *Phyllocactus phyllanthoides* plants growing in a cold greenhouse in Italy became affected by a wilt which was rapidly fatal to seedlings and caused plants over one year old to wither slowly or remain stunted and valueless. Brown, elongated spots were present at the collar, which was markedly constricted, and later spread outwards and upwards. A species of *Pythium* was constantly present in diseased material, sometimes in association with a *Fusarium* resembling *F. dianthi* [*R.A.M.*, xvi, p. 183]. The mature conidia measured 8·7 μ in diameter, and were provided with a germ-tube 2 μ in diameter.

Inoculations made by spraying a conidial suspension of the *Pythium* on healthy *P. phyllanthoides* in pots under glass at 26° to 27° C. were successful in nine days. Zoosporangia formed measuring 40·6 μ in

diameter, and containing 7 to 8 oval zoospores, 14·5 μ in diameter, and provided with peritrichiate cilia. Inoculations with a zoospore suspension on *P. phyllanthoides* plants of various ages under cool greenhouse conditions gave positive results only on very young plants, occasionally when sprayed, invariably when wounded.

In advanced infections pale yellow oogonia, 28 to 29 μ in diameter, were formed, with an epispore 2·9 μ thick, and provided with one, or exceptionally two, clavate antheridia. Oospore germination was not observed. The fungus is regarded as a new species and is named *Pythium cactacearum* [with a Latin diagnosis].

Control consists in the destruction of infected material, and improved ventilation of the greenhouse. Slightly affected plants may recover, but in severe cases a fresh crop should be sown in disinfected seed-beds. A preventive application of 0·5 per cent. copper sulphate and lime spray may be made to seedlings.

TYSON (J.). **Snowmould injury to Bent Grasses.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xix, 2, pp. 87–92, 7 figs., 1936.

Investigations during the winter of 1935–6 on the relative susceptibility to snow mould [*Calonectria graminicola*] injury of various bent [*Agrostis*] grasses in experimental turf plots resulted in the following rating (in decreasing order of resistance): (1) Astoria Colonial, (2) Washington and Metropolitan creeping, (3) Rhode Island and Prince Edward Island Colonial, (4) German mixed, and (5) Seaside creeping [*R.A.M.*, xv, p. 706]. Very severe infection by the fungus occurred on plots treated continuously with organic nitrogenous fertilizers, ammonium sulphate, urea, sodium nitrate, and especially calcium nitrate being much less injurious in this respect. The most economical of the very effective mercurial preparations tested against snow mould were mercuric chloride, calomel [mercurous chloride], mixtures of these two compounds, and red mercuric oxide [cf. ibid., xvi, p. 57], applied at rates of 2 to 4 oz. per 1,000 sq. ft., preferably mixed with dry, screened soil and broadcast over the turf.

KLINKOWSKI (M.). **Die Luzerne als Objekt der Pflanzenpathologie.** [Lucerne as an object of phytopathological study.]—*Forschungsdienst*, ii, 9, pp. 457–474, 1936.

This is a concise summary of the outstanding literature published during the last six years on the insect pests and fungal, bacterial, virus, and physiological diseases of lucerne. A bibliography of 332 titles is appended.

TOOVEY (F. W.), WATERSTON (J. M.), & BROOKS (F. T.). **Observations on the black-stem disease of Lucerne in Britain.**—*Ann. appl. Biol.*, xxiii, 4, pp. 705–717, 1 pl., 4 figs., 1936.

An account is given of investigations at Cambridge of the black stem disease of lucerne [*R.A.M.*, xvi, p. 184], which was recorded for the first time in Great Britain in the spring of 1934, and has since been found to occur in several other counties, while a similar disease of lucerne has also been observed in Wales. The causal fungus isolated from the lesions was shown in pure culture to be *Ascochyta imperfecta*

[ibid., ix, p. 274], the spores of which are extremely variable in size (3·7 to 15·0 by 1·7 to 4·2 μ) and in the percentage of uniseptate spores in the pycnidia; some collections and cultures only contained unicellular spores. The fungus was compared with cultures of *Phoma medicaginis* obtained from North America, with which it entirely agreed in all cultural and other details, and the second binomial is therefore considered to be a synonym of *A. imperfecta*, a conclusion which is supported by the fact that the British and the North American fungi both produced identical types of lesions in simultaneous inoculation experiments. Examination of type specimens of *Diplodina medicaginis* Oud. from Holland showed that this fungus is also synonymous with *A. imperfecta*.

Under experimental conditions *A. imperfecta* was also able to infect *Medicago lupulina* and *Trifolium pratense*, but has not been found on these hosts in the field. The disease may result in serious loss of lucerne herbage, but can be held in check by early cutting of the first crop each season.

Kozlowski (A.). **Soil conditions in relation to little leaf or rosette of fruit trees in California.**—*Phytopathology*, xxvi, 11, pp. 1041–1049, 1 graph, 1936.

In support of his contention, disputed by Chandler and Hoagland, that little leaf or rosette of fruit trees is due to the interaction of various fungal parasites (normally not very virulent) and adverse soil and climatic conditions [*R.A.M.*, xiv, p. 767], the writer resumes and enlarges upon the evidence already presented, which is further corroborated by tabulated chemical analyses of aqueous extracts from soils of affected orchards in California. The supposed curative effect of zinc sulphate applications is thought to be actually a result of improved soil conditions associated with colloid precipitation and a favourable adjustment of the hydrogen-ion concentration.

Davis (M. B.) & Blair (D. S.). **Cold storage problems with Apples.**—*Sci. Agric.*, xvii, 3, pp. 105–114, 1 fig., 1936. [French summary.]

A study at Ottawa of the behaviour of McIntosh and Fameuse apples in cold storage showed that loss from fungal rotting can be largely controlled by careful handling. Most cases of invasion occur at stem punctures, at bruises, or where the stems have been pulled out. Out of 1,752 cases of infection 61·87, 26·88, 8·56, 1·83, and 0·86 per cent. were caused by *Penicillium* spp., *Alternaria* spp., *Botrytis* spp., *Mucor* spp., and undetermined organisms, respectively. A study of temperature relationships showed that 2·03, 3·33, 6·35, and 10·79 per cent. of the rots occurred at 30°, 32°, 36°, and 40° F., respectively. Rots due to *Penicillium* spp. were less prevalent at the high than at the low temperatures. Those due to *Alternaria* spp. were greatly suppressed at the low temperatures, but at 40° were nearly as abundant as the *Penicillium* rots. The *Botrytis* infections developed much more readily under low than high temperatures. Decay due to *Mucor* spp. was confined almost entirely to the lots examined on the first and second sampling dates, i.e., 11th January and 4th March, 1935.

With McIntosh apples picked on 17th and 28th September, and 9th

October, 1934, and wrapped in oiled paper before storage, scald only developed after removal to a temperature of about 60°, when the average amounts [ibid., xv, p. 812] for all storage temperatures were, respectively, 17·33, 7·33, and 0 per cent., the corresponding figures for the Fameuse variety, picked on the same dates, being 31, 1, and 0 per cent. Immaturity at picking was obviously responsible for the scald development. The percentage amount of scald was significantly higher at storage temperatures of 30° and 32° than at either 36° or 40°.

In both Fameuse and McIntosh apples physiological breakdown (which causes by far the greatest loss in cold storage) takes the form of core-flush [ibid., xvi, p. 185]. In the latter variety a close correlation was observed between storage of immature fruits and premature core-flush development, particularly in storage at temperatures over 32°. Placing apples in storage when just at the climacteric appeared to induce rapid core-flush and immediate storage of fruit picked at the proper stage of maturity is recommended. The ideal temperature for the storage of Fameuse apples appears to be 32°, while 36° is satisfactory for McIntosh.

The results obtained with apples from different orchards and fertilizer plots indicated that nutrition does affect keeping quality, and tended to confirm the importance of the phosphorus-nitrogen ratio. Nitrogen applications to part of a Fameuse orchard under grass improved the keeping quality at 36° and 40° while similar applications to the mulch section brought about a significant deterioration in this respect. An application of nitrogen and phosphorus to the grass section (6 lb. nitrate of soda and 3 lb. superphosphate per tree) completely destroyed the keeping quality at the same temperatures, but on the mulch section improved it. In other plots under grass applications of 3 lb. nitrate of soda and 6 lb. slag per tree produced 100 per cent. core flush, a combination of 9 lb. and 6 lb., respectively, gave 12 per cent., and 3 lb. nitrate of soda alone 8 per cent. At Kentville, Nova Scotia, of two plots given nitrogen and acid phosphate over a period of twenty years, one plot receiving twice as much acid phosphate as the other, the plot given the smaller amount of phosphorus produced 6·3 per cent. breakdown, as against 22·1 per cent. in the other. Complete fertilizers (about 9–5–7) have produced better results than one or two element applications over a long period.

Gas storage experiments at Ottawa showed that McIntosh apples stored in 7½ per cent. carbon dioxide at 40° F. for about 2 months do not show scald upon removal from storage but fruit stored for longer periods is affected.

YOUNG (L. C.) & BAILEY (C. F.). **Progress report on the investigation of corky core of Apples.**—*Sci. Agric.*, xvii, 3, pp. 115–127, 2 figs., 1936. [French summary.]

In investigations carried out during 1934–5 in New Brunswick into apple corky core [*R.A.M.*, xvi, pp. 42, 186] promising control was given by combined magnesium sulphate and borax dry injections (9·6 and 0·5 gm., respectively), boric acid dry injections (0·8 and 0·7 gm.), boric acid wet injections [amount unspecified], borax dry injections (0·12 to 0·8 gm.), borax wet injections (1·5 to 2·1 gm.), and borax spray

(0·0125 per cent. boron). Magnesium and zinc failed to give control, and isolated failures occurred with boron though the effectiveness of this substance in controlling cork is clearly indicated. In all experiments the branch and not the tree was taken as the unit of experimentation and the results are fully tabulated.

The disease was observed in orchards with varying degrees of fertility and even in trees growing practically wild. Its intensity fluctuated from year to year. A study of root distribution indicated that in unaffected areas the larger roots tended to be concentrated at greater depths than they were in affected areas. There was a lack of correlation between the disease and plugging of the vascular ray cells [cf. ibid., xii, p. 453].

The boring of holes in the trees is regarded as undesirable, and spraying is a promising substitute method of applying the boron. Soil applications of borax at the rate of 4 lb. per 20-year-old tree did not injure the trees in seven weeks.

Atkinson (J. D.). **The control of corky-pit of Apples in New Zealand.**—*N.Z. J. Sci. Tech.*, xviii, 4, pp. 381–390, 5 figs., 1936.

Full details are given of the writer's continued experiments (on a larger scale than those previously reported) in the control of corky pit [or corky core] of apples in the Nelson district of New Zealand [*R.A.M.*, xiv, p. 592 and preceding abstract], where the disorder has been known since 1912, pears being also occasionally affected. Boron compounds were applied to the trees as follows: (1) Soil applications round the trunk, with or without digging in; (2) solutions injected into the soil round the tree by means of a lance and hand pump; and (3) injections at various strengths into the trunks. The soil treatments were carried out on six apple varieties, namely, Premier, Delicious, Washington, Jonathan, Sturmer, and Granny Smith, using borax and boric acid at the rates of $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, and 4 lb. per tree (6 and 8 lb. also in the case of Granny Smith). Both materials were injected at rates of 2, 4, 8, and 16 gm. per tree.

Fourteen treated Premier, 3 Delicious, 26 Washington, and 14 Jonathan remained practically free from pitting, while three controls of each variety averaged 76, 74, 71, and 59 per cent., respectively, of diseased fruit. Only one of the 67 treated Sturmers developed more than 8 per cent. pitting, the remainder being for all practical purposes sound, while the seven controls averaged 76·7 per cent. Similarly with Granny Smith, only one of the 82 treated trees developed more than 9 per cent. pitting and most were well below this figure, whereas the average percentage of the disease among the 16 checks was 87. Applied to the soil at the rates of 6 and 8 lb. per tree both borax and boric acid proved toxic, but no adverse effects followed the use of 4 lb. or less; injections of 8 and 16 gm. were also liable to cause damage, irrespective of the amount of solvent used.

Piper (C. S.). **The boron status of South Australian Apples.**—*J. Coun. sci. industr. Res. Aust.*, ix, 4, pp. 245–248, 1936.

The boron content of apples from various districts in South Australia was found to range from 12 to 30 parts per million of dry matter and

to show no relation to the incidence of bitter pit [*R.A.M.*, xv, p. 812] or McAlpine's confluent type of the disease.

BERWITH (C. E.). **Apple powdery mildew.**—*Phytopathology*, xxvi, 11, pp. 1071–1073, 1936.

A study was made of conidial germination and the inception of infection in *Podosphaera leucotricha*, the agent of powdery mildew of apple, under local conditions in California, where the disease is stated to be far more virulent than at corresponding latitudes remote from the Pacific coast [*R.A.M.*, ix, p. 547]. The optimum temperature for the germination of the conidia (which did not exceed 5 per cent. under the most favourable conditions) was found to lie between 19° and 22° C. [ibid., vi, p. 733]. High atmospheric humidity (approximating to 100 per cent.) was shown to be essential to germination, and under these conditions the infection of young apple leaves was accomplished in 45 to 48 hours at temperatures between 13° and 25°, conidiophores being produced in five days. The resistance of the foliage to infection increased rapidly with age after the first day following emergence, but was partially overcome by abrasion of the surface with carborundum. Attempts at ascospore germination were unsuccessful, but the mycelium, haustoria, and conidia were demonstrated in the deeper layers of the resting terminal and lateral buds completely invested by the fungus, which probably, therefore, survives the winter in the vegetative form [loc. cit.].

COOLEY (J. S.). **Sclerotium rolfsii as a disease of nursery Apple trees.**—*Phytopathology*, xxvi, 11, pp. 1081–1083, 1 fig., 1936.

Sclerotium rolfsii was readily isolated from the diseased roots of apple trees [*R.A.M.*, xii, p. 377] in a Maryland nursery in August, 1935, but similar experiments at a later date in the same season yielded few or no positive results, indicating that the fungus dies shortly after killing its host. Eighteen out of the 20 trees inoculated with sclerotia of the fungus in the following February were found to be extensively infected a month later, the causal organism being reisolated from the diseased tissues. The first sign of infection on nursery stock is a web of white mycelium on the tree at soil-level and on the surrounding soil, followed a few days later by the development on the same sites of sclerotia. By this time the bark is destroyed right round the collar, and the top soon becomes involved. The fungus does not advance far beyond the roots, but the stem may be invaded a short distance above soil-level. *S. rolfsii* appears to be more prevalent on relatively moist than on dry soils and may be responsible for appreciable losses—up to 5 per cent.—among nursery stock.

CHEAL (W. F.). **A note on the growth of the Apple scab fungus (Venturia inaequalis Aderh.) on Bramley's Seedling Apples during the winter 1934–1935.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 310–311, 1936.

In 1934 Bramley's Seedling apples stored out of doors in England

owing to the large crop showed unusually vigorous colonies of *Venturia inaequalis*. Detailed observations on 13 scab colonies on three apples showed that their average diameter increased from 5·076 mm. on 10th December, 1934, to 6·23 mm. on 13th February, 1935. This result confirms that obtained by Wormald with Bismarck apples [*R.A.M.*, xiv, p. 111], and emphasizes the importance of 'pin spot' scab at picking time.

PARKER (K. G.). **Fire blight: overwintering, dissemination, and control of the pathogene.**—*Mem. Cornell agric. Exp. Sta.* 193, 42 pp., 1 fig., 4 diags., 1936.

This is a comprehensive summary, based on the writer's experimental observations and on a study of the relevant literature, of the available knowledge on the overwintering, dissemination, and control of fire-blight (*Erwinia amylovora*) [*Bacillus amylovorus*] on apples and pears [*R.A.M.*, xii, p. 766; xvi, p. 157] in New York and California.

The exudate for the inoculation of the first spring blossoms may be provided by small overwintering twig cankers, but in the average New York season this mode of infection does not appear to be common. Usually blight infections are traceable to the larger overwintering cankers within the orchard, but in one instance the primary attacks on the blossom were apparently caused by inoculum carried in from outside the block under observation. The bacteria may be conveyed to the blossoms by splashing rain if the hold-over cankers are situated in the upper part of the tree, or through the visits of certain flies [ibid., xv, p. 589], e.g., *Bibio albipennis* and *Cynomyia cadaverina*, and possibly ants (*Formica fusca* var. *subsericea*), though the experimental evidence is too scanty to justify any definite conclusion as to the importance of this mode of transmission. In the case of secondary infection, however, blossom-visiting insects, including bees, are probably a more prolific source of inoculum than rain. Sucking insects of various kinds appear to be of considerable importance in the primary and secondary inoculation of terminal shoots, in which rain may also be a factor, while both agencies are involved in the infection of leaves, the water entering through natural apertures or wounds.

An appreciable reduction both in the incidence of fireblight and in the downward spread of infection was effected by the introduction into Bartlett and Clapp's Favorite pear and Ben Davis apple blossoms, either before, after, or simultaneously with *B. amylovorus*, of certain bacteria found by Thomas and Ark [ibid., xiv, p. 702] to be antagonistic to the fireblight pathogen. This line of attack is believed to merit further consideration, whereas the common practice of canker excision, besides being tedious and laborious, results in the loss of large amounts of bearing wood. Treatment of the cankers with relatively strong solutions of zinc chloride [ibid., xvi, p. 45] is effectual but apt to destroy unduly large areas of the living bark. In the writer's experiments cadmium sulphate solutions at concentrations of 15 per cent. and upwards proved toxic to the cankers without seriously injuring the sound tissues, while some degree of promise was also shown by aluminium sulphate and cadmium bromide.

SMITH (M. A.). **Infection studies with Sclerotinia fructicola on brushed and nonbrushed Peaches.**—*Phytopathology*, xxvi, 11, pp. 1056–1060, 2 figs., 1936.

It has been suggested that the common practice of brushing peaches to remove the pubescence liable to harbour dirt, spray residue, and other foreign substances may increase facilities for fungal infection, and experiments were accordingly conducted at the Missouri Agricultural Experiment Station to determine the relative susceptibility to brown rot (*Sclerotinia fructicola*) [*R.A.M.*, xvi, p. 108, and next abstract] of brushed and unbrushed fruit of the Elberta variety.

Infection of the unbrushed surfaces was found to occur mainly by way of the hair sockets after a minimum period of 8 hours, the corresponding time for brushed fruit, which was penetrated chiefly through broken hair sockets, being 4½ hours. In neither lot were stomatal or direct infections common. It is evident from the outcome of these tests that the greater rapidity of infection in the brushed peaches was correlated with the enhanced accessibility of the treated surfaces to the germinating conidia of the fungus.

HIENTON (T. E.) & FAWCETT (K. I.). **The precooling of fresh fruit.**—*Agric. Engng, St. Joseph, Mich.*, xvii, 9, pp. 377–378, 382, 5 figs., 1936.

Technical details are given of various types of equipment in actual or prospective use in the United States for the precooling of fresh fruit and vegetables to eliminate the risk of mould development in transit, with special reference to *Rhizopus nigricans* on strawberries [*R.A.M.*, xiii, p. 176] and peaches [ibid., xii, p. 378] and to brown rot [*Sclerotinia fructicola*] of the latter [see preceding abstract]. One of the factors affecting the temperature in the cars is the amount of salt used on the ice, the maximum limit for strawberries being about 800 lb. Peaches should be packed either in crates or in well-ventilated baskets to ensure adequate circulation of air round the fruit.

FOËX (E.) & LANSADE (M.). **Une maladie du Bananier.** [A Banana disease.]—*Rev. Bot. appl.*, xvi, 183, pp. 887–892, 1936.

Most of the information in this paper on a disease of Masri bananas (*Musa cavendishii*) in Syria associated with *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* and four bacteria has already been noticed from another source [*R.A.M.*, xv, p. 732]. In an addendum to the paper it is stated that as a result of the energetic measures pursued by the Government (comprising removal of diseased plants and disinfection of the holes), the disease has entirely disappeared.

VOGT (E.). **Die chemischen Pflanzenschutzmittel. Ihre Anwendung und Wirkung. Zweite, neubearbeitete Auflage.** [Chemical plant protectives. Their application and effect. Second revised edition.] —117 pp., 15 figs., Berlin and Leipzig, Sammlung Göschen No. 923, W. de Gruyter & Co., 1936. RM 1.62.

The revised edition of this useful compendium, first published in 1926 [*R.A.M.*, vi, p. 496], gives information on the standard plant protectives authorized by the German Plant Protection Service.

Koenig (P.). **Bodendämpfung für Landwirtschaft und Gartenbaubetrieb.** [Soil steaming for agriculture and horticulture.]—*Tech. in d. Landw.*, xvii, 8, pp. 223–225, 4 figs., 1936.

An account is given of the technical and practical sides of the writer's experiments in the introduction into Germany of steam sterilization of the soil on American lines. Promising indications of the value of the method in combating diseases as well as in the improvement of the soil have already been obtained at the Reich Tobacco Research Institute, Forchheim, near Karlsruhe, using steam columns [cf. *R.A.M.*, xvi, p. 124] supplied by the firm of Kyffhäuserhütte (Artern).

Gallwitz (K.). **3. Reichsnährstands-Ausstellung Frankfurt a. M. 1936. Technik der Schädlingsbekämpfung.** [Third Reich Food Board Exhibition at Frankfurt-am-Main, 1936. The technique of pest control.]—*Tech. in d. Landw.*, xvii, 8, pp. 161–162, 1 fig., 2 diags., 1936.

Particulars are given of the construction and application of two improved motor spraying machines (Gebr. Holder, Metzingen and H. C. Fricke, Bielefeld), a knapsack equipment, 'Matex' (C. Platz, Ludwigshafen), and the soil-steaming apparatus supplied by the Kyffhäuserhütte, Artern [see preceding abstract], all displayed at the third exhibition of the Reich Food Board at Frankfurt-am-Main in 1936.

Pushin (F.). Опрыскиватели. [Sprayers.]—*Mechanization of Plant Protection, Bull. Pl. Prot., Leningr., Ser. III (Control measures and implements), 1936*, 8, pp. 7–24, 8 figs., 1936.

A tabulated account is given of comparative working tests which were carried out in 1935 in the Crimea of German, American, and Russian power spraying apparatus under orchard, vineyard, and field conditions. The best practical results are stated to have been obtained with the tractor-driven apparatus 'X' constructed by OMVIZR [Mechanization Section of the Pan-Soviet Institute for Plant Protection] works, which was shown to be able to spray 1,700 apple trees (5 to 40 years old, growing close together in rows 8 to 10 m. apart) in an 8-hour working day, with a spray output of 30 l. per minute, and only required two men to work it. Next in all-round efficiency came the horse-driven 'Pioneer' sprayer of the 'Vulcan' Works, with a working capacity of 1,300 trees per day, and a tractor-driven sprayer of the same works with a working capacity of 2,280 trees per day. The tests showed the presence in the Russian sprayers of a number of structural and other defects, which were reported to the respective works, with suggestions for their elimination. While not wholly adapted structurally to the conditions in the Crimea, the American sprayers, such as 'Friend' and 'Bin' [?Bean] [*R.A.M.*, viii, p. 658; xi, p. 385], are outstanding by the simplicity of their construction, the resistance to wear and tear of the pump plungers, and their ease in movement, features which should be embodied, as far as possible, in the Russian apparatus.

While none of the apparatus tested was entirely satisfactory for work in the local open vineyards, the 'Pioneer' sprayer appeared to be the most suitable, and modifications are suggested for its improvement.

Yatzenko (I. P.). Опыливатели. [Dusters.]—*Mechanization of Plant Protection, Bull. Pl. Prot. Leningr., Ser. III (Control measures and implements), 1936,* 8, pp. 33–76, 7 figs., 5 diags., 1936.

The results of working tests in various parts of the U.S.S.R. of a number of Russian and foreign dusting appliances, both worked by mechanical and hand power, showed that all had some defects of sufficient practical importance under orchard, vineyard, or field conditions to preclude their use on a wide scale. The construction of each of the machines tested is discussed in some detail, with an indication of the points in which they failed to give satisfaction. On the basis of these findings a tractor-driven duster 'TN-3' was constructed in 1935 by the 'Vulcan' Works, and preliminary tests indicated that after certain improvements, which are discussed, this apparatus will be able to meet all the practical requirements for field work.

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1935.** [Bibliography of plant protection literature for the year 1935.]—Biol. Anst. (Reichsanst.) Berl., 352 pp., 1936.

This bibliography of German and foreign literature published during 1935 on various aspects of plant protection has been compiled on the usual lines [*R.A.M.*, xv, p. 241].

Kibi (M.). **On the varieties of Aspergillus oryzae employed in shoyu manufacture. Part I. Morphological differences.**—*J. agric. chem. Soc. Japan,* xii, 9, pp. 885–897, 4 pl., 1936. [Japanese, with English summary on pp. 130–131.]

Fifty-four strains of moulds were isolated from numerous samples of 'koji', the 'starter' in the manufacture of soy sauce, and shown by morphological and physiological investigations to belong to 28 varieties of *Aspergillus oryzae* [*R.A.M.*, x, p. 559], the chief distinguishing cultural characters of which are tabulated. The conidial diameters range from 3·5 to 10 μ and the corresponding stalk lengths from 0·2 to 2·2 mm.

Yenko (F. M.), Baens (L.), & Serrano (F. B.). **Effect of molds on Bakauan bark and tanning liquors.**—*Philipp. J. Sci.,* lx, 3, pp. 241–249, 3 pl., 1936.

During the transportation of bakauan (*Rhizophora* spp.) bark [used in the manufacture of tannin extract or cutch] from the mangrove swamps to the cutch factory in the Philippines the bark usually becomes infected with moulds. Isolations yielded only two species, however, namely, *Aspergillus niger* and *Penicillium glaucum.* The former disintegrated the cortical tissues but did not appear materially to affect the composition of the extract derived from the bark or to alter the colour of the manufactured leather. Bakauan extract containing 5 per cent. tannin is not subject to attack by *P. glaucum* and is only slightly affected by *A. niger*, while a tannin content of 2 per cent. is sufficient to delay the growth of the moulds. Microscopical observations and chemical analyses indicated that the latex tubes are the main objects of the fungal invasion, the involvement of the cell walls being relatively unimportant.

Chaze (J.). **L'Ivraie enivrante et la culture pure de son endophyte.** [Darnel and the pure culture of its endophyte.]—*C.R. Acad. Sci., Paris*, cciii, 18, pp. 885–887, 1936.

On 50 per cent. of the caryopses of darnel (*Lolium temulentum*) freed from external mould contamination by six to eight hours' immersion in calcium hypochlorite and subsequently sown in a darnel concoction, the slender, septate, branched, hyaline, later brown hyphae of an endophyte [*R.A.M.*, xiv, p. 700], from which arthrospores were abstricted, developed in two to three days. Microscopic examination showed that the mycelium originated in the internal fungal layer.

Magrou (J.). **Culture et inoculation du champignon symbiotique de l'Arum maculatum.** [Culture and inoculation of the symbiotic fungus of *Arum maculatum*.]—*C.R. Acad. Sci., Paris*, cciii, 18, pp. 887–888, 1936.

The development of the mycorrhizal endophyte of *Arum maculatum* in pure culture (soil decoction) [*R.A.M.*, xv, p. 243] being very limited, an attempt was made to reconstitute the symbiotic relationship by placing an aseptic *Arum* seedling in contact with the cultures enriched with agar, *A. italicum* being used in default of *A. maculatum*, the seeds of which failed to germinate. A typical mycorrhiza developed in three weeks, with long, rectilinear intercellular hyphae showing lamellar extensions, intracellular arbuscles of extreme complexity, and encysted, often bilobate vesicles. The presence of the last-named, similar to those from which the cultures were derived, is considered to prove that the development of the fungus, from root to root, described a closed cycle. This is believed to be the first recorded instance of the analysis and synthesis *in vitro* of a mycorrhiza involving an endophyte with arbuscles and vesicles.

Muller (H. R. A.). **Mycorrhiza van Citrus.** [Citrus mycorrhiza.]—*Landbouw*, xii, 1, pp. 1–10, 2 figs., 1 diag., 1936. [English summary.]

This is a critical review of Reed's and Mlle Frémont's study in California on the cytology and physiology of citrus mycorrhiza [*R.A.M.*, xv, p. 90], certain aspects of which are disputed by the writer on the basis of personal observations [? in Java]. For instance, the process interpreted in the Californian investigations as intercellular digestion of the hyphae is regarded merely as a phenomenon of autolysis of these elements following their death from the disintegration of the feeding haustoria within the host cells. The alleged beneficial influence of the mycorrhiza on the host is also called in question: the endophyte not only deprives the plant of valuable nutritive substances but involves it in an expenditure of energy to restore the equilibrium. The author concurs in Masui's opinion (*Mem. Coll. Sci. Kyoto*, Ser. B, iii, p. 149, 1927) that the curtailment of the infested rootlets of woody plants [cf. *R.A.M.*, vi, pp. 306, 307] is a sequel to the withdrawal of the host's food reserves by the endophyte, denoting a parasitic association [ibid., xv, p. 673]. The comparison drawn by Reed and Mlle Frémont between the citrus and pine mycorrhiza, the former representing a very unstable and the latter a particularly constant association, is not

considered altogether apt, since the pine mycorrhiza are of the ecto-endotrophic type with a fungal layer enveloping the roots and assisting their assimilation of organic matter from the soil [ibid., xv, p. 737], while the citrus endophyte, as already pointed out, is dependent on the host for its own food supply. In conclusion, the fact that in properly manured soils citrus roots show well-developed intracellular mycorrhiza with active digestion of the arbuscles, while in poorly growing trees the development of the endophyte is of a predominantly intercellular, parasitic character, is regarded as a consequence rather than a cause of the differences in vigour of the host. A judicious manuring scheme appears to benefit both parties to the association, whereas in the absence of proper nutrients the host suffers more than the fungus.

WEINDLING (R.) & EMERSON (O. H.). **The isolation of a toxic substance from the culture filtrate of Trichoderma.**—*Phytopathology*, xxvi, 11, pp. 1068–1070, 1936.

Details are given of the composition and properties of a crystalline constituent of the principle lethal to *Rhizoctonia* [*Corticium*] *solani* produced by a culture of *Trichoderma lignorum* [*R.A.M.*, xiv, p. 249; xv, p. 361], which can be isolated by extraction with chloroform in a separatory funnel. The solvent is conveniently used in three portions, each equal to 0·1 of the volume of the filtrate. After distilling the chloroform from the extract, the residue is taken up in a small amount of hot benzene or 95 per cent. alcohol from which, on cooling, silky, white needles crystallize. The highest yields of the crystalline substance (70 mg. per l. of filtrate) were obtained from cultures of *T. lignorum* grown in a highly acid (P_H 3 to 4) medium with ammonium tartrate as the nitrogen source, and subjected to a strong aeration. This constituent is toxic to the hyphae of *C. solani* up to a dilution of 1 in 300,000 parts (about two-thirds the toxicity of mercuric chloride). A yellowish-brown gum obtained by evaporating the mother liquors to dryness exerted a maximum lethal effect equivalent to that of the crystals and inhibited hyphal growth at a dilution of up to 1 in 3,000,000. Both crystals and gum are also toxic to *T. lignorum* at a minimum concentration exceeding by some 40 times that required to kill *C. solani*.

The crystalline substance is a compound of carbon, hydrogen, nitrogen, sulphur, and oxygen, possibly represented by the formula $C_{14}H_{16}N_2S_2O_{41}$, with a melting point at 185° C.; it is moderately soluble in acetone and chloroform and slightly so in hot benzene, hot ethyl or methyl alcohol, cold alcohol and ether, and water, is strongly laevorotatory, and has a molecular weight of approximately 340.

HILL (H.). **Minor elements affecting agricultural crops.**—*Sci. Agric.*, xvii, 3, pp. 148–153, 7 figs., 1936. [French summary.]

In discussing the influence of boron, copper, manganese, and zinc upon plant growth, with special reference to the results obtained in experiments at Ottawa, the author states that when boron was applied in increasing amounts to turnips in sand cultures, all the roots in the untreated controls and the series given the smallest amount of boron (0·25 p.p.m.) were severely affected after ten weeks by brown heart

[see above, p. 225], whereas the condition became progressively less marked with increased applications of boron, and the series given the largest amount (1·5 p.p.m.) showed 20 per cent. entirely healthy roots, with only a slight amount of disease in the remainder.

Potatoes in sand cultures without boron [*R.A.M.*, xvi, p. 55] were extremely poor in vigour, the leaf margins being crinkled and often yellow or red, the yield greatly reduced, the quality poor, the tubers scurfy or badly russeted, and the flesh yellow after cooking.

Apple trees known to be affected by blotchy cork [cf., ibid., xv, p. 520 and above, p. 261], when grown in pots and fed with nutrient solutions containing boron at the rate of 1 p.p.m., recovered completely, while untreated trees continued to show the condition. When 1 gm. of boric acid was injected into the limbs of affected trees in Ontario only 60 per cent. of the fruits became affected, as against 94 per cent. in the case of the untreated limbs. Under orchard conditions cork and corky core were invariably associated with an alkaline or high lime condition of the soil.

The addition of manganous sulphate to soil of P_H 8 taken from an orchard in Ottawa in which apple trees had shown severe chlorosis and strawberries marked lack of vigour with slight yellowing of the foliage, at the rate of 0·004 gm. per 5 in. pot, resulted in healthy and vigorous growth of strawberry plants planted in the pots in comparison with others grown in the same soil without the addition of manganese. In sand cultures with potatoes the plants without manganese were stunted, the petioles shortened, and the foliage light green, the older leaves being yellow between the veins and conspicuously curled; the yield was much reduced, and the tubers were badly russeted, with enlarged lenticels.

Experiments with copper and zinc failed to give any indication that these elements are universally requisite for normal growth.

KÖHLER (E.). **Studien über den Verlauf des Kartoffelabbaus auf dem Dahlemer Versuchsfeld der Biologischen Reichsanstalt.** [Studies on the course of Potato degeneration on the Dahlem experimental plot of the National Biological Institute.]—*Landw. Jb.*, lxxxiii, 6, pp. 859–868, 1 diag., 1936.

The observations of Wartenberg and collaborators to the effect that potato tubers of healthy origin planted in the late summer yield sound (non-'degenerate') progeny even on the Dahlem experimental plots, where liability to the diseases comprised under the general heading of deterioration is extreme [*R.A.M.*, xiv, p. 387], were confirmed by the writer in tests on the Erdgold and Direktor Johanssen varieties in 1935. The Y virus was found to be present in the progeny of practically all the tubers planted in May, considerably less in evidence in those of the June plantings, and virtually absent from the offspring of the tubers set in August. The last-named were also free from the X virus, which occurred in the earlier plantings, though to a lesser extent than Y. *Myzus persicae* is responsible for the transmission of the Y virus, but apparently not the X form, with which some other insect active at midsummer is presumably concerned.

The transmission of the Y virus from potato to Samsun tobacco [ibid., xvi, p. 116] is less readily effected by means of tuber juice than

with that from the foliage, which no doubt contains a much higher proportion of the infective principle. The operation may be considerably simplified, however, by the abrasion of the tobacco plants with carborundum and the dilution of the tuber juice with water (1:1).

WARTENBERG (H.) & HEY (A.). **Das Redoxpotential des Gewebebreies der Kartoffelknolle. Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. III. Mitteilung.** [The oxidation-reduction potential of the pulped tissues of the Potato tuber. The electrometric determination of the seed value of the Potato tuber. Note III.]—*Planta*, xxv, 2, pp. 258–281, 1 graph, 1936.

Continuing their investigations on the electrometric determinations of the seed value of potato tubers in relation to 'degeneration' [*R.A.M.*, xv, p. 822, and preceding abstract], the writers describe an experimental study on the estimation of the oxidation reduction potential of pulped tissues. The application of the data obtained to the vitality of the material will be discussed in a forthcoming communication.

NEWTON (W.) & EDWARDS (H. I.). **Virus studies. I. The production of antisera in chickens by inoculation with Potato X.**—*Canad. J. Res.*, xiv, 11, pp. 412–414, 1936.

Chicken antiserum was produced by three wing vein injections of 1·5, 2, and 2 c.c., respectively, at three-day intervals with purified sap from *Datura meteloides* and *D. stramonium* infected with the potato virus X, the blood samples being drawn eight days after the last inoculation. The antiserum formed a conspicuous precipitate when incubated for three hours at 37° C. with similarly purified sap of the same hosts infected with the virus X (or healthy potato virus), but formed no precipitate when similarly incubated with purified sap from virus-free plants. Two tobacco ring spot viruses, one originally isolated from spinach and the other from tomato, were found by means of the precipitin reaction through the use of chicken antisera to belong to the X group, and though distinct from each other and from other strains of the X virus as judged by symptom expression on several hosts, they possessed similar lethal temperatures, longevities *in vitro*, and host ranges to those of the potato virus X.

METZGER (C. H.). **Curly dwarf in Colorado.**—*Amer. Potato J.*, xiii, 11, pp. 316–317, 1936.

Curly dwarf of potatoes [*R.A.M.*, xv, p. 460] was first observed in the San Luis Valley, Colorado, on an occasional Brown Beauty plant in 1933. In 1935, following a severe drought and psyllid [?*Paratrioza cockerelli*] infestation in 1934, the disease was sufficiently severe to cause the rejection of 80 per cent. of the Brown Beauty (the only variety affected) acreage entered for certification. It was observed that the lower leaves of otherwise healthy plants on either side of infected individuals showed symptoms of curly dwarf, while plants opposite diseased ones in adjacent rows were also affected. Core-graft tests are in progress to verify these observations, which suggest that the disorder is due to an insect-transmissible virus. Apart from extreme dwarfing

(the diseased plants seldom attain a height exceeding 12 in.) and curling of the leaflets, the symptoms of the Brown Beauty stands were identical with those described by Orton (*Bull. U.S. Dep. Agric.* 64, 1914) for curly dwarf.

Many of the tubers from curly dwarf hills show triangular lesions with the epidermis curling away from the shallow cavities thereby created. After a period in storage a shallow, sunken, hard, leathery black area develops on the skin surrounding the lesion and penetrates the tuber to a depth not exceeding $\frac{1}{8}$ in. Cultures of this tissue yielded only saprophytic organisms. In a few cases the entire flesh turned brownish-yellow during storage at room temperature from August to December, while all the eyes died on some of the tubers.

EDDINS (A. H.). **Brown rot of Irish Potatoes and its control.**—*Bull. Fla agric. Exp. Sta.* 299, 44 pp., 6 figs., 2 graphs, 1936.

A full account is given of investigations carried out in Florida from 1929 to 1935 into brown rot or bacterial wilt (*Bacterium solanacearum*) [*R.A.M.*, xv, p. 459; xvi, p. 201] of potatoes and its control, the former name referring to the symptoms on the tubers only. The attack was so severe in the Hastings area in 1935 as to cause greater loss than that from all other potato diseases. Weather records from 1926 to 1935 inclusive showed that the rainfall was less, the mean temperature was higher, and the number of days when temperatures were favourable for brown rot (minimum 55°, maximum 77° F., or above) were greater in March 1935 than in March of any other year.

The disease occurs locally in all types of sandy soil, becoming less severe the longer the fields are cultivated. Samples of newly affected soils showed the P_H values to range from 4·32 to 5·42, compared with 4·42 to 6·2 for old land. The causal organism was killed in potato broth cultures acidified to P_H 4·02 and under, and on potato dextrose agar acidified to P_H 4·15 and under. It survived at P_H 8·71 when sodium hydroxide was used as the alkaline agent.

The disease was controlled experimentally by a single soil application of inoculated sulphur at rates ranging from 400 to 1,200 lb. per acre. Yields were decreased by the applications, but recovered as the soil adjusted itself to a more alkaline condition or when this was induced by the addition of calcium or dolomitic limestone one to three years after the sulphur treatment. The return to a normal P_H value was not accompanied by any return of the disease in two localities where the potatoes were grown in treated soil for 3 and 5 years, respectively. Inoculated sulphur at 800 lb. per acre induced P_H reactions lethal to the organism in the upper 8 in. of soil more rapidly when applied in June than in autumn or winter. Cowpeas used as green manure in 1935 significantly increased yield from 0·9 to 21·4 barrels per acre, but in 1934 the increase from 32·5 to 45·1 barrels is not regarded as significant. Hydrated lime (1,000 to 2,000 lb. per acre) gave some control of brown rot.

The common practice in the Hastings area of planting maize between rows of potatoes several weeks before digging was shown by an experiment in 1934 to increase infection by *Bact. solanacearum*. The planting operations were carried out three weeks prior to digging and resulted in injury to many potato roots with the consequent reduction in the

yield of healthy tubers of 21·2 barrels per acre. Elimination of the disease by crop rotation or weed eradication is regarded as quite impracticable owing to the number and nature of the hosts of *Bact. solanacearum*. A list of 60 hosts is given including four recorded as new, viz., *Solanum citrifolium*, *S. pyracanthum*, *S. sisymbrii*, and *Datura metel*.

In varietal susceptibility tests Green Mountain was the most resistant to brown rot of the tubers, followed in order by Katahdin, Bliss Triumph, Seedling 41914, Irish Cobbler, Spaulding Rose, and Chippewa. The percentages of plants wilted and killed was not a reliable criterion of varietal susceptibility, for some varieties had lower percentages of tuber infection and produced greater yields of healthy tubers than Spaulding Rose but showed approximately the same percentages of plant infection. Infected tubers continued to decay while in transit or when stored in the field.

ALCOCK (Mrs. N. L.) & FOISTER (C. E.). **A fungus disease of stored Potatoes.**—*Scot. J. Agric.*, xix, 3, pp. 252–257, 3 pl., 1936.

Of recent years stored potatoes in Scotland have been affected by a disease somewhat resembling the dry rot due to *Fusarium coeruleum* [*R.A.M.*, xiii, p. 649; xv, p. 705, *et passim*] and causing losses of up to 100 per cent. The first sign of infection usually consists of one or more shallow, circular depressions, $\frac{1}{16}$ in. in diameter, gradually enlarging to a size of 1 to 2 in. ('thumb marks') and assuming irregular oval or diamond-shaped forms. A somewhat reticulate wrinkling of the skin is common in the more advanced stages of the disease. The internal rotted areas measure from $\frac{1}{8}$ to 3 in. in diameter and do not always correspond exactly with the external lesions in size or depth. In the incipient phase of the disease the light brown, slightly watery, somewhat mealy tissues present an appearance identical with that due to *F. coeruleum*, but later the colour deepens to salmon-pink with a touch of grey and the tissues begin to shrivel, ultimately becoming dry and friable, dark greyish-pink to grey or even black. They are full of cavities lined with a septate, white to greyish-white mycelium bearing dark brown to black, carbonaceous, globoid or lenticular pycnidia, from which are extruded tendrils of hyaline, mostly non-septate, occasionally bi-, very rarely tricellular pycnospores. The intercellular mycelium is dark brown and profusely septate. The mycological and taxonomic aspects of the disease, the agent of which is an apparently undescribed representative of the Phomaceae, will be discussed elsewhere.

Inoculation experiments with cultures from single pycnospores on maize meal agar gave positive results without wounding on Arran Chief, Catriona, Di Vernon, Dunbar Cavalier, King Edward, and May Queen, while a number of others, including Doon Star (known to have been affected by a disease resembling the foregoing since 1927), contracted infection when inoculated over a bruise. The disease was also transmitted through cuts, and from infected to bruised tubers placed in contact, thereby confirming the view that the rot actually spreads in storage from a single focus of contamination. In a few instances the pycnidia have been found rupturing the skin of the tubers. The most susceptible varieties are Ally, Dunbar Cavalier, Catriona, Di Vernon,

Majestic, and Sharpe's Express; and generally speaking, the disease is most severe among the early sorts. Intensive cultural studies of 896 tubers showed that *F. coeruleum* and the *Phoma* dry rot were only present together in 90, so that the former is obviously not a necessary precursor of the latter.

CAIRNS (H.), GREEVES (T. N.), & MUSKETT (A. E.). **The control of common scab (Actinomyces scabies (Thaxt.) Güss.) of the Potato by tuber disinfection.**—*Ann. appl. Biol.*, xxiii, 4, pp. 718–742, 1936.

After summarizing the results obtained by previous workers on the control of common scab (*Actinomyces scabies*) of potatoes [*R.A.M.*, xvi, p. 121], the authors give a tabulated account of experiments which were carried out from 1932 to 1935, inclusive, in Northern Ireland. It was found that the disease is satisfactorily kept in check by the disinfection of seed-tubers before planting, provided a sufficient interval of time is allowed to elapse before the return of the potato crop to the same land. Under the six years' crop rotation scheme, which is normal in that region, satisfactory control was obtained in every case studied, and it is suggested that a four-year interval might possibly be sufficient. Still shorter intervals, however, are not considered safe, since they did not always afford good control of scab. No control was obtained from seed-tuber disinfection on land continuously grown to potatoes.

Among the fungicides tested, including mercuric chloride, formalin, copper sulphate, Burgundy mixture, and two proprietary mercury compounds A and B, the most satisfactory from the farmer's point of view were the last-named. In one preliminary experiment on fresh land, A at 0·5, 1·0, 1·5, and 3 per cent. gave 13·2, 8·7, 5·7, and 5·5 per cent. scabbed tubers (by weight), respectively, and B at corresponding strengths gave 17·6, 12·7, 8·6, and 7·8 per cent. compared with 6·9 for mercuric chloride (0·1 per cent., 90 mins. steep) and 49·9 for the untreated. In large scale field tests in 1935 on land free from potatoes for six years, treatment with A at 1·0 per cent. resulted in an average of 19·4 per cent. scabbed tubers, with B at 1·5 per cent. an average of 23·9 per cent., compared with 22·2 per cent. for mercuric chloride, and 76·4 per cent. for the untreated. The two mercurials were more effective as instantaneous dips ($\frac{1}{2}$ to 1 min.) than when used as 15 minute steeps at lower concentrations, and while B caused no growth depression at strengths up to 3 per cent., A was injurious at 2 per cent. Sometimes disinfection stimulated growth, but at other times a slight depression in growth was observed, which disappeared after 10 to 12 weeks. There was evidence that the planting of very slightly scabbed potatoes in land that had not been used for this crop for many years may result in a high incidence of the disease in the resulting plants.

DOROJKIN (N. A.). Итоги 7-летнего изучения порошистой парши Картофеля, **Spongospora subterranea (Wallr.) Johnson.** [Summary of seven years' investigations on powdery scab of Potato, *Spongospora subterranea* (Wallr.) Johnson.]—*ex* Порошистая Парша Картофеля [Powdery scab of Potato], pp. 5–38, 3 figs., 2 graphs, White Russian Acad. Sci., Inst. biol. Sci., Minsk, 1936.

The results of the investigations started in 1929 in White Russia

showed that powdery scab of potato (*Spongospora subterranea*) [*R.A.M.*, xvi, p. 118] may be of considerable economic importance, especially in years of heavy rains in May and June, and in moist soils, in which it may cause as much as 30 per cent. reduction in the crop, apart from losses due to increased liability of infected tubers to various storage rots, particularly late blight (*Phytophthora infestans*). The formation of wound cork below scab lesions on the tubers was only occasionally observed in White Russian material.

Researches in the U.S.S.R. have shown that the geographical distribution of powdery scab practically coincides with that of *P. infestans*, and that the former is prevalent and economically important in western Russia, as well as in the Azerbaijan and Armenian Soviet Republics in the Caucasus. It was established experimentally that infection of the crop may result both from infected seed-tubers and infected soil; in certain experiments, however, the crop raised from infected tubers planted in uninfected soil remained healthy, but a second crop from healthy tubers planted in the same plots was more heavily scabbed, demonstrating that diseased seed-tubers are very effective in introducing the powdery scab into new regions.

Confirmation was obtained of the efficacy of meranin [ibid., xiv, p. 330] in the control of powdery scab and of common scab [*Actinomyces scabies*]. Tests during seven years showed that while none of the commercial varieties used was immune from powdery scab, Jubel, Cobbler, and Parnassia may be considered as weakly susceptible, since these varieties were only occasionally infected. A series of artificial inoculations of wounded potato tubers with a heavy suspension of *S. subterranea* prepared from scab lesions triturated in distilled water showed that eight varieties of *Solanum* from South America were completely immune, as well as nine hybrids which were bred by the Pan-Soviet Institute for Plant Breeding.

The control measures recommended include compulsory crop rotation of not less than three years' duration, drainage of wet soils, disinfection of infected seed-tubers whenever complete rejection is not feasible, and the use of resistant varieties. Strict quarantine measures are also advocated for the prevention of the introduction of powdery scab into unaffected areas [ibid., xv, p. 400].

Rybakova (Mme S.) & Nedoshivina (H[elen]). К вопросу о порошистой парше. (Морфолого-биологические особенности возбудителя порошистой парши **Spongospora subterranea John.**). [On the problem of powdery scab. (Morphological and biological properties of the causal organism of powdery scab, *Spongospora subterranea* John.)]—*ex* Порошистая парша Картофеля [Powdery scab of Potato], pp. 57–85, 14 figs., White Russian Acad. Sci., Inst. biol. Sci., Minsk, 1936. [English summary.]

The authors give a brief historical, taxonomic, and morphological account of powdery scab of potato (*S. subterranea*) [see preceding and next abstracts], together with a discussion of its distribution in Western Europe, and in the U.S.S.R. Histological studies of material from White Russia showed that spore balls of *S. subterranea*, measuring 19 to 85·5 by 19 to 57 μ (average 47·8 by 40·5 μ), are present in the 10th to 15th

row of cells of the scab lesions, and plasmodia in different stages of development occur in the underlying cells. The invaded tissue consisted of crushed cells with half-destroyed or softened walls, containing very little or no starch at all. Wound cork underlying scab lesions was not found in White Russian material, but was occasionally seen in material from Georgia and North Ossetia [Transcaucasia], and from the Leningrad province. A description is also given of an aberrant form of powdery scab present in the Moscow region, which differs from that discussed above in that the spore balls are, as a rule, outside the host tissues, they are various tints of brown instead of yellowish green, have a plicate or irregularly crumpled surface, and may be agglomerated into a common damp mass; in size they vary from 94 to 134 by 20 to 25 μ, and their structure is not cellular. The host tissue did not show the presence of plasmodia, and wound cork is usual under the lesions. *S. subterranea* is generally considered to be restricted to Solanaceous plants, but N. A. Rojdestvenski is stated recently to have found specimens of *Ullucus tuberosus* of the Chenopodiaceae infected with it.

KIYANOVSKI (P. M.). Географические посевы Картофеля, зараженного порошистой паршой. [Geographical plantings of Potato infected with powdery scab.]—*ex* Порошистая парша Картофеля [Powdery scab of Potato], pp. 39–56, White Russian Acad. Sci., Inst. biol. Sci., Minsk, 1936.

ROVDO (A. S.). Географические посевы Картофеля, зараженного порошистой паршой, в БССР. [Geographical plantings of Potato infected with powdery scab in White Russia.]—*ex* ibid., pp. 87–110, 1936. [English summary.]

Details are given in these two papers of experiments carried out in 1935, in which potato seed-tubers infected with powdery scab (*Spongospora subterranea*) [see preceding abstracts], originating from White Russia and Armenia, were planted in various regions of the U.S.S.R., including areas where the disease has not yet been recorded, the second paper referring only to those carried out on the territory of the White Russia Soviet Republic. The results again confirmed the fact that the organism may be introduced into fresh ground with planting material; no infection developed, however, in regions such as those of Odessa, where the whole summer was exceptionally dry, and of Kieff, where no rain fell during the whole month of June. In Armenia, where the disease is prevalent, the infection in 1935 was slight, owing to dry weather conditions during the summer. The evidence collected indicated that powdery scab is directly dependent upon atmospheric precipitations and is co-extensive with late blight [*Phytophthora infestans*]. Control by soil drainage and by treatment of the seed-tubers with formalin (1 in 300 or 1 in 200) or meranin (1 in 2,000 or 1 in 1,000) is recommended.

RIPPEL (K.). **Über Begriff und Wesen der Bodenmüdigkeit.** [On the conception and nature of soil exhaustion.]—*Phytopath. Z.*, ix, 15, pp. 507–512, 1936.

A brief critical review is given of some outstanding recent contributions to the problem of 'soil exhaustion', the primary cause of which is

maintained to reside within the particular plant suffering from this condition. In connexion with a study at the Munich Technical College of the auxins of peas, the writer observed that *Saccharomyces cerevisiae* and a number of other *S.* spp. failed to multiply in a synthetic nutrient solution to which was added an aqueous extract of peas, the various moulds and other yeasts tested being unaffected. Good growth was made, however, in the filtrate of the pea extract shaken up with charcoal or boiled in sodium lye, both of which processes evidently eliminate the active principle. It was experimentally determined that a substance specifically inhibitory to the growth of *Saccharomyces* is contained in the roots, shoots, and cotyledons of peas, and it is suggested, on the basis of these tests, that the rapid exhaustion of soils by peas is due to the soil becoming permeated with secretions from the roots, especially dead ones, toxic to certain beneficial micro-organisms. A rational crop rotation would thus be the surest method of preserving agricultural soils in a state of biological and biochemical health.

Willis (L. G.). **Bibliography of references to the literature on the minor elements and their relation to the science of plant nutrition. Second edition.**—396 pp., Chilean Nitrate Educational Bureau, Inc., 120 Broadway, New York, 1936. [Mimeographed.]

The present edition of this valuable compendium of contemporary literature on various aspects (including phytopathological) of the relation between the minor elements [see above, p. 268] and plant nutrition contains some 3,000 references and abstracts, to which the compiler (soil chemist at the North Carolina Agricultural Experiment Station) proposes to add fresh material from time to time.

Summers (E. M.). **An investigation of types or strains of the mosaic virus of Sugar-Cane in Louisiana.**—*Iowa St. Coll. J. Sci.*, xi, 1, pp. 118–120, 1936.

A considerable body of evidence is available that more than four strains of the sugar-cane mosaic virus are present in Louisiana [*R.A.M.*, xvi, p. 125]. One virus source identified as strain 2 produced a new type of necrosis on the older leaves of infected Co. 281 canes. Another source, that had been regarded as strain 4, was used to inoculate Co. 281, and cuttings from this material subsequently showed about 40 per cent. germination recovery, though this had scarcely ever occurred in this variety before. An indication that yet another strain may be present was given by the appearance, in one field, of appreciable infection on C.P. 807, a variety long considered immune.

In 1925, P.O.J. 36–M, 213, and 234 showed 100 per cent. mosaic in most cane fields in Louisiana, but by 1930 the disease had almost entirely disappeared from all plantings of P.O.J. 213 and had become much less in those of the other two by a combination of 'foliage' and 'germination' recovery. A wave of secondary spread, starting in 1930 and becoming increasingly severe subsequently, has again brought infection in these varieties up to 100 per cent. At first, both types of recovery were common in P.O.J. 36–M, but no recovery has occurred in the newly infected P.O.J. 213 material.

Before the existence of different strains of the virus had been demon-

strated the differential rates of recovery observed in P.O.J. 36–M were attributed to a probable qualitative attenuation of the virus, while it was assumed that P.O.J. 213 had been infected with a virulent source directly from wild grasses, which had increased virulence. The discovery of the new strains, however, offered a more likely explanation of the problem, and evidence at present available indicates that strains of the virus are arising locally, possibly within the cane plant or by passage through other Graminaceous hosts.

Gumming disease.—*Aust. Sug. J.*, xxviii, 8, pp. 484–485, 1936.

Provision is reported to have been made by the Minister for Agriculture and Stock for the rigorous enforcement of the quarantine regulations against gumming disease of sugar-cane [*Bacterium vasculorum*] in Queensland [*R.A.M.*, xvi, p. 205]. Fresh outbreaks were observed in 1936 and any further extension of the infected area would necessitate the exclusion of the valuable S.J. 4 and Clark's Seedling canes from the entire district between Mossman and Mulgrave.

Mayor (E.). **Notes mycologiques. IX.** [Mycological notes. IX.]—*Bull. Soc. neuchâtel. Sci. nat.*, lxi, pp. 105–123, 1936.

In these studies on 36 fungi of the Neuchâtel canton [*R.A.M.*, xiii, p. 655], the following items are of special interest. *Erysiphe nitida* was found on all the green parts of *Delphinium cultorum*, besides occurring in the canton of Geneva on *D. grandiflorum*, a new host for the fungus in Switzerland. A species of *Oidium* was observed affecting *Antirrhinum majus*. *Cronartium asclepiadeum* [*Peridermium pini*: see below, p. 288] was found on trunks of *Pinus montana* both in Neuchâtel and Berne cantons, in each of which this host is a new record. In the latter locality the uredospores and teleutospores of the fungus were noted on *Vincetoxicum officinale*.

Of 22 species of *Allium* inoculated with *Melampsora allii-fragilis*, pycnidia and caeomata were readily obtained on *A. ascalonicum*, *A. cepa*, *A. fistulosum*, *A. porrum*, *A. schoenoprasum*, and 14 others, whereas *A. angulosum*, *A. paradoxum*, and *A. scorodoprasum* were entirely resistant. When similar inoculations with caeomata found in nature on *A. oleraceum* and *A. vineale* were inoculated into 17 species and varieties of *Salix*, all except *S. pentandra* and *S. alba* × *triandra* remained unaffected. The former developed numerous uredospores and teleutospores; the latter showed few uredospores, which disappeared after a short time.

Caeomata of *M. allii-salicis albae* were found on *A. vineale* and were shown experimentally to be associated with the uredospores and teleutospores of the fungus on *S. alba* and *S. vitellina*. Experimental evidence showed that all the infected willows belonged to the section with unicoloured bracts. In artificial infection tests in a glasshouse pycnidia and caeomata were obtained on the same species of *Allium* as were found susceptible to *M. allii-fragilis*, but *A. angulosum*, *A. parodoxum*, and *A. scorodoprasum* were again resistant.

Artificial inoculation of *Abies alba* in a glasshouse with the teleutospores of *Milesia kriegeriana* [ibid., xiii, p. 117; xv, p. 469] found on

Dryopteris filix-mas resulted in the production of white aecidia resembling those found in nature.

The aecidia of *M. polypodii* [loc. cit.], a fungus commonly present locally on the fronds of *Polypodium vulgare*, were noted on the year's needles of *Abies alba* (a new record for Switzerland) growing near *P. vulgare* heavily infected by the uredospores. Infection experiments [which are described] demonstrated conclusively that the fungus forms its aecidia on *A. alba*; these organs develop at the beginning of August and can be observed until November. The pycnidia, which are difficult to see and appear to be fugacious, occur near aecidia in process of formation. The aecidia develop only on the lower surface of the current year's needles. The globose, subglobose, or elongated aecidiospores measure 20 to 35 μ in diameter, and have a verrucose membrane approximately 1 μ thick. The peridia are well-developed, and seen in the flat appear to have polygonal cells with a verrucose membrane; seen from the side they have a smooth outer membrane 2 μ thick and a verrucose inner membrane 2 to 4 μ thick.

Sydow [H.]. **Mycotheca germanica Fasc. LVII–LX (no. 2801–3000).**—*Ann. mycol., Berl.*, xxiv, 4–5, pp. 387–401, 1936.

Nineteen of the species included in the fascicles LVII to LX of the author's Mycotheca germanica are furnished with taxonomic commentaries. *Microthyriella rubi* [*R.A.M.*, xii, p. 788] occurs both on the leaves and tendrils of *Aristolochia sipho*, fructifications being formed, however, only on the latter organs for several years in succession, though they were observed on the foliage of *Mahonia* [*Berberis*] *aquifolium*. *Pseudopeziza meliloti* n.sp. ad int., found on *Melilotus alba* leaves in Westphalia, differs from the widespread *P. medicaginis* [ibid., x, p. 192; xii, p. 177; xiv, p. 424] and *P. trifolii* [ibid., xiv, p. 241] in its ovate or elliptical ascospores, tapering bluntly at both ends, 8 to 11 by 4 to 5 μ; another specimen is in the possession of the writer from the same host in Lithuania. *Coleophoma rhododendri* n.sp., occurring on wilting or moribund leaves of cultivated *Rhododendron* in Westphalia, differs from *Phyllosticta rhododendricola*, the agent of grey, brown-edged lesions on the same host, in its conidial dimensions (13 to 20 by 2 to 2·5 μ compared with 8 to 10 by 3 μ) and in the absence of any apparent spotting of the foliage. *Colletotrichum idaeinum* is the agent of an apparently serious disease of raspberry runners, on which it produces conspicuous vesicular, rapidly crumbling spots. *Pseudodiscosia* [*Heteropatella*] *antirrhini* [ibid., ix, p. 247], hitherto recorded only on *Antirrhinum majus*, forms white, somewhat sunken lesions on the stems and occasionally on the leaves of *A. orontium*.

Nannfeldt (J. A.). **Notes on type specimens of British inoperculate Discomycetes. (First part, notes 1–50.)**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 191–206, 1936.

Notes are given on the type specimens of 50 British species of inoperculate Discomycetes in the herbaria at the British Museum and Kew. The species discussed are arranged alphabetically according to the names in Ramsbottom's List of British Discomycetes (*Trans. Brit.*

mycol. Soc., iv, pp. 343–381, 1914) and most of them are stated to have been known, under different names, on the Continent.

The type specimen of *Trichoscypha calycina* var. *trevelyani* (Cke) Boud. (syn. *Peziza calycina* var. *trevelyani* Cke, *Lachnella calyciña* var. *trevelyani* Phill., *Dasyscypha calycina* var. *trevelyani* Sacc.) shows that this fungus is identical with *Trichoscyphella willkommii* (Hart.) Nannf. (= *Dasyscypha willkommii* Hart.) [*R.A.M.*, xv, p. 693; xvi, p. 220]. The author found no spores larger than 24 by 8 μ, and the average size was 20 by 7 μ, typical for *T. willkommii*. He considers that the larger measures given by Cooke must be erroneous.

Canonaco (A.). **Contributo alla flora micologica dell'A.O.I. I. Micromiceti dell'Eritrea. II. Ustilaginee.** [A contribution to the mycoflora of Italian East Africa. I. Micromycetes of Eritrea. II. Ustilagineae.]—Reprinted from *Boll. Giard. bot. Palermo*, xiv, *1936*, 28 pp., 3 pl., 1936.

This annotated list of fungi from Eritrea, Italian Somaliland, and Abyssinia includes, *inter alia*, the following records of phytopathological interest: *Uromyces striatus* [*R.A.M.*, xiii, p. 290] occurred on lucerne, *Puccinia allii* [ibid., xv, p. 57] on garlic leaves, *P. pruni-spinosae* [ibid., xvi, p. 108] on almond and peach leaves, *Melampsora lini* on flax leaves, and *Phakopsora zizyphi-vulgaris* [ibid., xv, p. 401] on the leaves of *Zizyphus spina-christi* and *Z. jujuba*. *Pleosphaerulina briosiana* on lucerne [ibid., viii, pp. 604, 753] differed from the type in its larger spores which measured 24 to 32 by 10 to 12 μ. *Parodiella perisporioides* [ibid., vii, p. 679] was found on *Indigofera arrecta* leaves, and *Darluca filum* [see above, p. 237] was very common on the uredosori of Uredineae on various Gramineae.

Ascochyta jasminicola n.sp. [with a Latin diagnosis] causing a rounded zonate, leaf spot with dark margins, 5 to 8 mm. in diameter, on an undetermined species of jasmine, is characterized by elliptical or ovate, continuous, later uniseptate, hyaline spores measuring 6 to 8 by 4 μ. Other records are *Septoria lycopersici* [ibid., xv, pp. 538, 690] on tomato leaves, *Cycloconium oleaginum* on olive leaves [ibid., xiv, p. 706], and *Tilletia levis* [*T. foetens*] on wheat.

Fraser (Lilian). **Notes on the occurrence of the Trichopeltaceae and Atichiaceae in New South Wales, and on their mode of nutrition, with a description of a new species of Atichia.**—*Proc. Linn. Soc. N.S.W.*, lxi, 5–6, pp. 277–284, 2 pl. [facing p. 360], 10 figs., 1936.

The Trichopeltaceae and Atichiaceae are families of epiphyllous Ascomycetes considered by the writer to form part of the sooty mould complex [*R.A.M.*, xv, p. 530]. They are usually associated with other sooty moulds, the most important of which are the Capnodiaceae, and both are specialized, though very differently, for their environment, and do not appear to be closely related systematically. Evidence is presented showing that both families are saprophytic epiphytes dependent on scale insect excretions, without penetrating the host tissue by haustoria or other means.

Following a brief review of the systematic literature on the Trichopeltaceae, the author records, with annotations, *Trichopeltis reptans*,

Brefeldiella brasiliensis, and *Trichothallus hawaiiensis* for the first time in New South Wales, all chiefly on the leaves of rain-forest trees. Of the Atichiaceae *Atichia glomerulosa* (17 collections), *A. millardeti* (58), and *Phycopsis vanillae* (9) are also recorded for the first time from the same locality, and a new species, *A. botriosa*, is described, with a Latin diagnosis. The last-named was collected on *Callistemon pallidus* and is distinguished from all other species of the genus by the comparatively long and narrow branches of the propagulae, which are 1- to 5-, usually 3-branched, 55 to 75 by 10 to 14 μ, by the shape and method of branching of the thallus, and by the filamentous nature of the cells composing it.

Shih (Y. K.). **A taxonomic study of the genus Aspergillus around Wuchang, Central China (Hyphomycetes).**—*Lingnan Sci. J.*, xv, 3, pp. 365–378; 4, pp. 607–612, 1 pl., 1936.

Full descriptions are given of 42 species and strains of *Aspergillus* [including *A. laokiashanensis* n.sp. from leather, *A. chungii* n.sp. from the air, and 3 new varieties, for all of which Latin diagnoses are supplied] found near Wuchang, Central China, and identified by Dr. C. Thom. The habitat of each fungus is indicated and the paper concludes with a key for the identification of the species and varieties recorded.

Kari (L. E.). **Mikromyceten aus Finnisch-Lappland.** [Micromycetes from Finnish Lapland.]—Reprinted from *Ann. bot. Vanamo*, viii, 3, iv+25 pp., 1936. [Finnish summary.]

This annotated list of over 280 fungi (mostly rusts, smuts, Ascomycetes, and fungi imperfecti), collected in Finnish Lapland in 1925 and 1931, includes many new records and eight species to be described by Petrak as new to science in a forthcoming paper.

Goto (K.). **Sclerotium rolfsii in perfect stage. IV. Cytological observations.**—*Ann. phytopath. Soc. Japan*, vi, 2, pp. 101–118, 1 pl., 27 figs., 1 diag., 1936. [Japanese summary.]

An intensive study of the cellular and nuclear relations in *Sclerotium rolfsii*, which has shown the fungus to be predominantly plurinucleate, has given on the whole convincing proof that the variation previously reported in the perfect (*Corticium*) stage [*R.A.M.*, xv, p. 401] is a result of the segregation and recombination of hereditary factors in the course of sexual reproduction.

Subba Rao (M. K.). **Pink disease.**—*Bull. Tea sci. Dep. unit. Plant. Ass. S. India*, 10, 25 pp., 8 figs., 1936.

In this comprehensive account of pink disease (*Corticium salmonicolor*) [*R.A.M.*, xi, p. 768; xvi, pp. 1, 106] of tea in southern India the author states that the disease was observed on *Grevillea robusta*, coffee, dadap (*Erythrina lithosperma*), *Eucalyptus robusta*, *E. globulus*, *Melia azadirachta*, *Cinchona* [*calisaya* var.] *ledgeriana*, *C. succirubra* [ibid., x, p. 298], *Artocarpus integrifolia*, mango, *Jasminum* sp., and *Aleurites montana* (apparently a new host), as well as on tea. Examination of affected tea confirmed the observations of Brooks and Sharples on rubber both with regard to the basidial fructification often being sterile and

also to the irregular hymenial surface. On *G. robusta, M. azadirachta, A. montana*, mango, and *Eucalyptus* spp., however, the fructifications were fertile and the basidia were found to be arranged regularly. The fungus grew very well and with profuse coloration in culture on peptone cane sugar, potato dextrose, and lemco agar. Cultures on onion agar plus 2 per cent. gall-tannin developed a brown halo, indicating that the fungus is capable of destroying lignin.

Inoculations made in April, 1933, in dry weather conditions on wounded and unwounded tea branches gave negative results. Similar experiments carried out a month later, when a few showers were experienced, showed 8 successful inoculations out of 16, but the fungus made little progress. When freshly cut branches, however, were inoculated during the same period and kept moist, small, pink cushions appeared on them after a week and inoculations on a potted tea plant covered with a bell jar lined with moist paper gave a similar result. Continuous rain fell in June, when inoculations on potted plants in the open also gave positive results, and the inoculated branches died in October. It was concluded that the fungus is unable to progress in the dry season, that extremely humid conditions are necessary for infection, progress being checked by a dry period even after the fungus has become established, and that both healthy and wounded tissues are susceptible.

The disease generally appears during the rainy season, and becomes serious only on mature bushes. Usually the fungus is confined to the fresh growth that develops after pruning, but it may descend to the lower primary branches or the main stem, which, however, resist the attack. The diseased branches show cankered areas and the young branches may be killed. The disease was not found on China tea. The humid conditions necessary for the development of infection are favoured by the increasing age of the bushes since pruning, and the presence of shade trees. Experimental evidence showed that spraying infected bushes with agral shirlan without removing the diseased branches did not eliminate the disease, but when this precaution was taken before spraying the disease did not again appear during the succeeding rains, though neighbouring untreated bushes became infected.

WYCKOFF (R. W. G.) & COREY (R. B.). **X-ray diffraction patterns of crystalline Tobacco mosaic proteins.**—*J. biol. Chem.*, cxvi, 1, pp. 51–55, 1 pl., 1936.

Using a gas type X-ray tube with a chromium target capable of day and night operation at a power consumption somewhat in excess of a kilowatt, the authors obtained a series of powder diffraction photographs of crystalline tobacco mosaic virus proteins [*R.A.M.*, xvi, p. 212]. The patterns thus secured, with many sharp reflections between 80 Å. and 3 Å., are exactly those to be expected from true crystals composed of large molecules. No differences could be detected between the patterns of the proteins of the ordinary and aucuba strains of the disease, neither did the photographs undergo any alteration after nine successive recrystallizations. Tobacco mosaic virus protein completely inactivated by means of ultra-violet irradiation

[ibid., xvi, p. 213] and subsequently crystallized gave a photograph the principle diffraction lines of which agree with those of the active protein.

BEALE (HELEN P.). **Possible relationship of Stanley's crystalline Tobacco-mosaic-virus material to intra-cellular inclusions present in virus infected cells.**—Abs. in *Contr. Boyce Thompson Inst.*, viii, 4, p. 333, 1936.

In a piece of epidermis from the back of the midrib of a Turkish tobacco leaf affected with Johnson's tobacco virus 1 or 6 and treated with hydrochloric acid of approximately P_H 1·3 the author observed oblong, crystalline masses which developed cross striations and broke up into needle-shaped crystals that floated out free in the cells. The crystalline plates disintegrated into honeycombed, granular masses, which were the ends of the needle crystals with their long axes at right angles to the basal plane of the plate. In gross appearance the needles were indistinguishable from those formed upon acidification of virus extract purified by Stanley's method [see preceding abstract]. When excess acid was added after the needles had formed they went into solution, leaving the cell nucleus and X bodies intact. Intracellular precipitation of needle-shaped crystals was obtained with six different hosts of the viruses, and three different acids. Healthy Turkish tobacco plants and others affected with the tobacco ring spot virus or potato virus X gave negative results. The marked similarity in gross appearance of the needle crystals obtained in the cells and by Stanley's method, and their similar behaviour upon acidification, suggests a common source in the plate crystals.

LOJKIN (MARY). **Inactivation of Tobacco mosaic virus by ascorbic acid.** —Abs. in *Contr. Boyce Thompson Inst.*, viii, 4, p. 335, 1936.

The reduced form of ascorbic acid in concentrations of 0·03 mg. per c.c. completely inactivated purified preparations of the tobacco mosaic virus [see preceding abstracts], but inactivation occurred only when the acid in the virus solution was oxidized by atmospheric oxygen. The addition of copper catalysed the auto-oxidation and stimulated the inactivation. The virus remained active when oxidization was brought about in the absence of atmospheric oxygen by iodine, 2-6-dichlorophenolindophenol, and potassium permanganate. Dehydroascorbic acid did not inactivate the virus under the same conditions in which the reduced form produced inactivation. The virus in the whole juice was less readily inactivated than in the purified form.

HIRAYAMA (S.) & YUASA (A.). **Cytological study of Tobacco mosaic. II.** —*Ann. phytopath. Soc. Japan*, vi, 2, pp. 119–128, 12 figs., 1936. [Japanese, with English summary.]

Mosaic tobacco plants produced 88·91 per cent. apparently normal pollen grains (36·20 per cent. of which failed to germinate on an agar medium with 5 per cent. glucose) and 11·09 per cent. degenerate ones, the corresponding figures for healthy plants being 88·34 and 11·66 per cent., respectively; 47·56 per cent. of the healthy, normal grains were unable to germinate. Seeds obtained from crosses between diseased and healthy

plants and from self-pollination were largely abortive, not on account of the abnormality of pollen grains or ovules in the former, but possibly due to Kostoff's 'female sterility' [virus: *R.A.M.*, xii, p. 600; xv, p. 754]. Most of the normal seeds, on the other hand, were germinable. Tobacco plants inoculated with the expressed juice (boiled for 15 minutes) of diseased plants showed neither mosaic symptoms nor X-body formation [ibid., xv, p. 322], so that the latter is evidently a function of the active virus and not of the inactivated principle in the expressed juice. Amorphous structures simulating X-bodies developed in the cytoplasm of healthy plants grown in nutrient solutions containing 0·05 per cent. ammonium molybdate, or the same amount of lactic acid [ibid., xiv, p. 51].

GRATIA (A.) & MANIL (P.). **Pourquoi le virus de la mosaïque du Tabac et le virus X de la Pomme de terre ne passent-ils pas à la descendance par les graines?** [Why are the Tobacco mosaic and X Potato viruses not transmitted to the progeny through the seed?] —*C.R. Soc. Biol., Paris*, cxxiii, 29, pp. 509–510, 1936.

Previous experiments having established the non-transmissibility of the tobacco mosaic and X potato viruses through the seed [*R.A.M.*, xvi, pp. 52, 67], the writers sought to ascertain the basis of this fact by an examination of extracts of the pollen grains of healthy and mosaic tobacco, and of healthy and X potato-infected *Datura*. Precipitin tests of extracts in physiological solution from pollen grains commencing germination by means of antisera of healthy and diseased plants showed the viruses to be absent from the pollen grain, and other tests showed the anthers also to be uninfected. Similar extracts were then prepared from the green calyx, the discoloured pink corolla, the white stamens, and the pistil of a mosaic tobacco plant. The tobacco mosaic antiserum flocculated the calyx juice in ten minutes and that of the corolla in two hours, but the juice of the stamens and pistils both reacted negatively. Evidently the virus gradually becomes attenuated and ultimately disappears during the differentiation of the floral organs. The transmission or non-transmission of viruses would not appear, therefore, to involve a problem of heredity but merely to represent an instance of the very erratic behaviour of these infective principles in regard to localization in the various plant organs.

HILL (A. V.) & ANGELL (H. R.). **Downy mildew (blue mould) of Tobacco: prevention of its development in inoculated and infected seedlings by benzol.**—*J. Coun. sci. industr. Res. Aust.*, ix, 4, pp. 249–254, 1936.

In further experiments in the control of tobacco downy mildew (*Peronospora tabacina*) [*R.A.M.*, xvi, p. 131] the disease was prevented by keeping the seedlings in benzol vapour continuously from the time of inoculation for three to six days. More effective control of the fungus is obtained apparently by intermittent than by continuous exposure to benzol, and the practice of removing covers from seed-beds on fine days is not likely to result in disease development. In another series of experiments seedlings in which mycelium was present were exposed to benzol vapour for eight days (sometimes less) and the plants

remained healthy after the benzol was removed for 14 or more days, so that it is concluded the fungus in the tissues was inactivated or killed. Used after sporulation had begun, benzol almost prevented the further production of conidia. The data obtained showed that it is very important to prevent, as far as possible, contamination of seedlings from diseased plants during the last week in the seed-beds.

SHARP (A.). **Tobacco seedbed covers.**—*J. Dep. Agric. W. Aust.*, xiii, 2nd Ser., 4, pp. 503–507, 1 fig., 1936.

In tests carried out in Western Australia in 1936 with various types of covers for use on tobacco seed-beds treated with benzol against downy mildew [*Peronospora tabacina*: see preceding abstract] calico treated with linseed oil was the most satisfactory as regards seedling growth, but became unfit for further use by the end of the season. The best results were obtained by using a fairly cheap, unbleached calico treated with a solution made up of 12 lb. 125°/130° paraffin wax, 1 lb. clear petroleum jelly, 1 pint boiled linseed oil, and 2 galls. mineral turpentine.

SHEFFIELD (F[RANCES] M. L.). **The histology of the necrotic lesions induced by virus diseases.**—*Ann. appl. Biol.*, xxiii, 4, pp. 752–758, 2 pl., 1936.

In the experiments discussed in this paper the leaves of *Nicotiana glutinosa* plants were inoculated with tomato aucuba mosaic [tobacco virus 6: *R.A.M.*, xvi, p. 66] when they were about 10 cm. long, i.e., after cell division had normally ceased in them two or three weeks previously. Histological examination showed that about 12 hours from inoculation a band of dark staining material began to form between certain of the cell walls, most frequently between the cells of the lower epidermis and those of the spongy parenchyma; occasionally, however, this band first appeared between the palisade cells, spreading rapidly downwards from towards the upper to the lower side of the leaf. Simultaneously with the formation of this band nuclear division was observed in the spongy parenchyma cells within it, but it was not followed by cell division. As the necrotic band extends, the cells within it die and dry out, and in about three days the lesion consists of a meshwork of this necrotic material, within which the virus is isolated from all interchange between the infected and healthy parts of the leaf. The necrotic material was found to be insoluble to concentrated acids and alkalis, and did not react with any of the more common reagents.

SHAPOVALOV (M.) & DUFRÉNOY (J.). **Un virus infectant des Solanées et des plantes d'ornement dans le sud-ouest de la France.** [A virus infecting Solanaceae and ornamental plants in the south-west of France.]—*C.R. Soc. Biol., Paris*, cxxiii, 31, pp. 696–698, 1 fig., 1936.

Spotted wilt is stated to be common on tomatoes in the south-west of France, where it is chiefly conspicuous by the development on the fruits of sharply defined white or yellowish spots, as described by Petri from Sicily. The expressed juice of green fruits is infectious but not

that of ripe ones. The virus persists during the winter in dahlia rhizomes [*R.A.M.*, xv, p. 444] and in the spring is carried by the larvae of *Thrips tabaci* to annuals, such as tomato and tobacco. Pale-flowered dahlias are particularly susceptible to spotted wilt and rapidly degenerate under its influence. Though normally systemic infection may sometimes be restricted to the primary lesions or it may extend, in the case of young plants, along the leaf veins and stems in the form of necrotic areas, this phase being known as 'canker' in tobacco and 'die-back' in tomatoes (U.S.A.) [ibid., xiv, p. 201]. In the Compositae, e.g., dahlia and *Callistephus chinensis*, the cells of the affected region contain a refringent spherical inclusion in the vacuolar solution, staining with Sudan III.

NEWTON (W.). **Virus studies. II. Streak X, a disease of Tomatoes caused by a virus of the Potato X group unassociated with Tobacco mosaic.**—*Canad. J. Res.*, xiv, 11, pp. 415–418, 1 pl., 1936.

A tomato streak disease caused by a virus of the potato X group unassociated with tobacco virus 1 greatly reduced the yield of marketable fruit in several greenhouses near Victoria, British Columbia. The symptoms consisted in a pronounced striping and necrosis of the stems and leaves, with blotching of the fruit, and thus resembled those of 'experimental streak' induced in tomatoes infected with tobacco virus 1 and re-inoculated with the potato virus X [*R.A.M.*, xv, p. 123].

The host range, lethal temperature (65° to 70° C.), longevity *in vitro* and dilution extinction point of the virus ('streak X') resembled those of the ordinary potato virus X [see above, p. 270]. Streak X is distinguished from the latter by the more pronounced symptoms it induces in tobacco (conspicuous multiple rings with secondary net-like mottle and necrosis), *Datura stramonium*, *Nicotiana glutinosa* (both mottle followed by necrosis), and tomato, and particularly by the streaking and necrosis it causes in the stems and leaves of the last-named. The absence of local lesions of tobacco virus 1 on *D. stramonium* and *N. glutinosa* established the disease as distinct from any form of Ainsworth's streak group [*R.A.M.*, xiv, p. 261].

Streak X virus could not be recovered from inoculated apparently healthy Irish Cobbler potatoes [carrying virus X] after 10 days' incubation, and tomatoes infected with the ordinary virus X were completely immunized against it. On the other hand, the virus was recovered unchanged from inoculated X-free potato seedlings. The precipitin reaction also demonstrated that it belongs to the potato virus X group.

GRIEVE (B. J.). **A staining and maceration method of tracing the path of the vascular bundles in herbaceous plants, and its application in observations on the distribution of Bacterium solanacearum in relation to epinastic curvatures in petioles of Tomato and Potato plants.**—*Proc. roy. Soc. Vict.*, N.S., xlix, 1, pp. 72–74, 1 pl., 1936.

In experiments designed to show the relation between *Bacterium solanacearum* and epinasty and root formation in infected tomato and potato plants [*R.A.M.*, xv, p. 539; xvi, p. 201] the stems were severed at the base and the plants placed in 1 per cent. solutions of eosin or basic fuchsin for one to two hours until the dye was visible in the

topmost leaves. The petioles were then cut off, the epidermis slit, and the plants immersed in boiling nitric acid (15 per cent.) for a few seconds in the case of tomato stems and one to five minutes in that of well-developed potato stems. After washing in running water for ten minutes, the plants were allowed to stand in water overnight. The epidermal and cortical tissues could then be easily dissected away. The vascular tissue and the dyes were unaffected by the acid, so that the path of the bundles was clearly evident. Vessels clogged with bacteria failed to allow the passage of the stain, and on dissection the infected bundles were yellow and the non-invaded vessels red. By this means it was possible to trace the time of development of the adventitious roots along the infected stem and to determine their relationship to the bacteria.

SOMMER (H.). **Nochmals: Ahornsterben in der Baumschule.** [Another note on the dying-off of Maples in the nursery.]—*Blumen u. PflBau ver. Gartenwelt*, xl, 47, pp. 566–567, 1936.

Verticillium albo-atrum is thought to be probably responsible for a considerable proportion of the mortality among nursery maples [*Acer* spp.: *R.A.M.*, xiv, p. 265; xvi, p. 217] in Germany. Other hosts of the fungus include *Prunus* and *Spiraea*. Control should be based on a rational scheme of crop rotation, supplemented by the immersion of the maple roots, prior to planting, in a loam emulsion with the admixture of 2·5 gm. uspulun per l.

LAUBERT (R.). **Die Blattfallkrankheit der Pappeln.** [The leaf fall disease of Poplars.]—*Kranke Pflanze*, xiii, 11, pp. 196–197, 1936.

Nursery poplars in the Mülheim (Ruhr) district and elsewhere in Germany were attacked by *Marssonina populi-nigrae* [*Pseudopeziza populorum*: *R.A.M.*, xv, p. 618] and *M.* (*P.*) *populi-albae* [ibid., xi, p. 136] the former affecting *Populus nigra*, *P. balsamifera*, and other representatives of the same group, while the latter was confined to *P. alba*. The fungi produce exclusively on the upper leaf surfaces, chiefly of the annual shoots and lower branches, numerous dingy brown to blackish spots of varying dimensions with ill-defined or fimbriate margins, resulting in premature defoliation.

HIGGINS (B. B.). **Morphology and life history of some Ascomycetes with special reference to the presence and function of spermatia. III.**—*Amer. J. Bot.*, xxiii, 9, pp. 598–602, 13 figs., 1936.

The morphology and life-history of the fungus known as *Cercospora liriodendri*, the agent of a dark brown, angular leaf spot and partial defoliation of tulip poplars (*Liriodendron tulipifera*) in the Middle Atlantic and Gulf States, has been followed throughout the year. In addition to the conidial stage described by Ellis and Harkness (*Bull. Torrey bot. Cl.*, viii, p. 27, 1881), the fungus produces during the late summer and autumn ovate to globose or depressed-globose, black spermogonia, 45 to 75 by 40 to 70 μ, rod-shaped, hyaline spermatia, 2 to 3 by 0·5 to 1 μ, ovate to subglobose, black, ostiolate perithecia, 45 to 91 by 45 to 72 μ, and cylindrical, clavate, short-stipitate, fasciculate, aparaphysate asci, 33 to 44 by 6 to 7 μ, containing eight cylindrical,

straight or slightly curved, blunt or tapering at the ends, uniseptate ascospores, 9·6 to 16·8 by 2·5 to 3·5 μ. The spermogonia mature and usually cease to produce spermatia by December, whereas perithecial formation is not concluded until the following spring. The clavate to elliptical, pale olivaceous, uni- to tri-septate conidia, 14·4 to 34 by 5 to 7 μ, are borne on fasciculate, basally branched, sparsely septate, thin-walled, apically geniculate, brown conidiophores, 72 to 132 by 3·6 to 5 μ. Cultures from ascospores and conidia were similar in every respect but remained sterile. Evidence of a genetic connexion between the two stages was obtained, however, by placing ascospores directly on *L. tulipifera* leaves and tracing the development of the typical brown lesions associated with the imperfect phase, as well as by the observation of young perithecia and spermogonia forming at the base of the conidiophores. The fungus is renamed *Mycosphaerella tulipiferae* (Schw.) n.comb., syn. *Sphaeria* (*Depazea*) *tulipiferae* Schw., with revised diagnoses in English and Latin.

HIRT (R. R.). **A simple device for recording the time and duration of rainfall.**—*Phytopathology*, xxvi, 11, pp. 1064–1067, 1 fig., 1 diag., 1936.

The apparatus devised by the writer for registering the time and duration of rainfall in relation to the infection of white pine [*Pinus strobus*] by *Cronartium ribicola* [*R.A.M.*, xvi, p. 219] consists essentially of recording sheets divided by mimeographed radial lines into hours and half hours, with three concentric lines drawn with indelible lead near the outer edge of the sheet. The record sheets were mounted on a revolving brass disk substituted for the hour hand of a clock. The apparatus was provided with a removable cover made from heavy roofing paper, in which a slit 2 in. long was cut directly over the circles, each end of the slit being $\frac{1}{48}$ of the circumference of the circle made by it during rotation, so that an interval of 15 minutes was required for one radial line of the sheet to pass the opening. When it rained, water fell through the slit and stained the indelible lines on the portion of the record sheet exposed beneath. The instrument was tilted slightly forward so that the water ran rapidly off and did not blur the sheets.

SNELL (W. H.). **The relation of the age of needles of Pinus strobus to infection by Cronartium ribicola.**—*Phytopathology*, xxvi, 11, pp. 1074–1080, 1936.

With the ultimate object of giving definite dates of past epiphytotic outbreaks of *Cronartium ribicola* [see preceding and next abstracts] and of correlating waves of infection with meteorological conditions, experimental studies were carried out in New Hampshire and New York, involving (1) the artificial inoculation with *C. ribicola* of potted white pines (*Pinus strobus*), (2) the exposure of potted pines to natural infection, and (3) observations of cankers on young planted pines. The results generally tend to support the view that the current season's needles, in contrast with those of *P. monticola* [*R.A.M.*, xiii, p. 283], show a varying degree of enhanced susceptibility towards the rust as compared with those of the second season. The question cannot, however, be regarded as finally settled pending the accumulation of

further and more convincing evidence. In this connexion attention is drawn to the inadvisability of experimenting on trees potted in the same season, since the transplanting operation is liable to weaken their vigour and so minimize the likelihood of infection, the rust preferring a thriving host.

Liese (J.). **Zur Frage der Vererbbarkeit der rindenbewohnenden Blasenrostkrankheiten bei Kiefer.** [On the question of the heritability of the blister rust diseases of Pine.]—*Z. Forst- u. Jagdw.*, lxviii, 11, pp. 602–609, 1936.

This is an amplified account, embodying supplementary data relating to recent experiments, of the writer's studies on the heritability of *Cronartium asclepiadeum* (*Peridermium pini*) on Scots pines (*Pinus sylvestris*) in north Germany [*R.A.M.*, x, p. 351; xi, p. 486; xiv, p. 339], the transmission of susceptibility to which by the seed may now be regarded as definitely established. Great importance attaches to these observations from the standpoint of practical silviculture, since it is obvious that the seed from diseased trees, however desirable in other respects, must be absolutely barred as propagation material. It is particularly unwise to make use for this purpose of cones indiscriminately collected in the course of felling operations.

The author considers it probable that susceptibility to *C. ribicola* in the case of *P. strobus* [see preceding abstracts] is similarly inherited.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 12, pp. 263–264, 269–271, 1936.

Austria (Federation). As from 16th April, 1936, the following countries are considered to be free from potato wart (*Synchytrium endobioticum*) for the purpose of supplying fresh tubers for Austria [*R.A.M.*, xv, p. 464]: Egypt, Italy, Jugo-Slavia, Malta, Cyprus, Spain, and Hungary [cf. ibid., xv, p. 752].

Austria (Salzburg). By the terms of Decree No. 76 of 7th April, 1936, it is incumbent upon garden-owners or occupiers to eradicate all junipers [*Juniperus sabina*] infected by pear leaf cluster-cups (*Gymnosporangium sabinae*) [ibid., xv, p. 103] and growing in the vicinity of pear trees.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*NachrBl. dtsch. PflSchDienst,* viii, 9, pp. 198–206, 1936.

Morocco (French zone). A Vizirial Decree of 1st August, 1936, published in the official bulletin (1,244) on the 28th and coming into force three months thereafter, provides that all tomato, eggplant, and potato consignments entering the French zone of Morocco must be accompanied by properly authenticated certificates vouching for the cultivation of the above-mentioned plants in areas more than 20 km. distant from any focus of wart disease (*Synchytrium endobioticum*) [*R.A.M.*, vii, p. 815; xvi, p. 144]. In the case of potatoes the distance may be reduced to 5 km. on production of satisfactory evidence that the consignments have been inspected in the country of origin and found free from infection.

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Rohde (T.). **Schüttegefährdung verschiedener Douglasien-'Herkünfte'.** [The liability to needle-fall of Douglas Firs of diverse origins.]—*Z. Forst- u. Jagdw.*, lxviii, 11, pp. 610–616, 2 diags., 2 graphs, 1936.

The control of the needle-fall of Douglas firs [*Pseudotsuga taxifolia*] due to *Rhabdocline* [*pseudotsugae*: *R.A.M.*, xvi, p. 147] by eradication of diseased trees being apparently impracticable, efforts must be made to reduce the extent of the damage by the selection of resistant types. With this end in view, the writer laid out a test plot with material of 17 diverse origins close to a diseased stand near the North Sea coast. Although no hard-and-fast correlation could be detected between the incidence of infection and the source of the trees (1,111 out of 3,984 of which developed needle-fall symptoms), the three *caesia* groups showed a remarkable degree of resistance compared with the representatives of *glauca* and *viridis*. It was noticed that in many trees the lower branches, overgrown with grass, were severely attacked while the upper ones remained healthy; in the former case the adhesion and germination of the spores was probably promoted by humidity.

Hansbrough (J. R.). **The Tympanis canker of Red Pine.**—*Bull. Yale Univ. Sch. For.* 43, ix+58 pp., 12 pl., 2 figs., 5 graphs, 1936.

In this paper [a shorter version of which has already been noticed from another source: *R.A.M.*, xiv, p. 612] describing in detail his investigations into the canker disease of red pine (*Pinus resinosa*) caused in North America by a fungus previously identified as *Tympanis pinastri* [ibid., xvi, p. 8], the author states that J. W. Groves has pointed out in an unpublished thesis (Toronto) that Tulasne's name can only be applied to *T. pinastri* occurring on the true firs (*Abies* spp.). The fungus causing this disease is therefore designated *Tympanis* sp. pending further work on its identity.

The condition only occurs south of the optimum range of red pines, and is generally worse on poor than on good sites, infection being inversely related to vigour as expressed in height and diameter growth of paired trees. The fungus is a weak parasite of red pine, and causes disease only when the host is debilitated by environmental conditions.

Individual infected trees may be killed outright by girdling of the main stem, or they may remain alive indefinitely. A permanent disfigurement of the bole usually results, brought about through resin

infiltration of the wood under the canker, through decay of the wood by secondary fungi which have gained access through the open cankers, by discoloration of the sapwood owing to staining organisms, or through breaking of the main stem at the cankers.

Loss caused by the disease is unlikely to exceed 10 per cent. of the expectation value of the stands. In individual plantations a light, scattered infection may even act as a beneficial thinning. Mixed planting with white pine [*P. strobus*], 8-ft. spacing, and judiciously timed pruning and thinning offer an appreciable degree of control. No special sanitation measures are recommended.

Bavendamm (W.). **Die Grauschimmelfäule der Nadelhölzer.** [The grey mould rot of conifers.]—*Tharandt. forstl. Jb.*, lxxxvii, 11, pp. 853–856, 2 figs., 1936.

This is a popular note on the infection of conifers, e.g., *Abies* and *Picea* spp. and *Pseudotsuga douglasii* [*P. taxifolia*] by *Sclerotinia fuckeliana*, the ascigerous stage of *Botrytis cinerea* [*R.A.M.*, xii, pp. 316, 340], the grey rot caused by which is stated to be very prevalent in Germany in wet seasons such as 1936, when it assumed a semi-parasitic form. The disease caused in the spring a yellowing, dying-off, and falling of the needles and desiccation of the shoots, which curled over, mostly in a downward direction. The conidial stage of the fungus develops from the black sclerotia formed at the base of the dead shoots in the autumn.

Robertson (W. A.). **Report of the Director of Forest Products Research for the year 1935.**—*Rep. For. Prod. Res. Bd, Lond., 1935*, pp. 3–55, 6 pl., 5 graphs, 1936.

The following items are of phytopathological interest in this report [*R.A.M.*, xv, p. 185]. The Committee of the British Standards Institution has appointed a panel to examine the details of a standard laboratory test for determining the toxicity of wood preservatives in the laboratory to be based on the standard test agreed to by the International Conference held in Berlin in 1930 [cf. ibid., xv, p. 621]. During the examination of strains of fungi used in the tests at different laboratories it was observed that the strain *Fomes annosus* No. 517 of the Forest Products Laboratory, Madison, extensively used as a standard test fungus in the United States, is actually *Polyporus tulipiferus*.

In experiments made to determine the absorption of preservatives at various stages during the hot and cold open-tank process [ibid., xv, p. 695], it was ascertained that if the charge is heated a second time (i.e., after one cooling) a quantity of the absorbed liquid is expelled, so that if the timber is removed at this stage a considerable economy in preservative is effected, amounting in the case of absorbent timber, such as Scots pine [*Pinus sylvestris*] sapwood, to as much as 50 per cent. of absorbed creosote.

Field tests of natural durability showed that the following are not durable under exposed conditions: beech, sycamore [*Acer pseudoplatanus*], London plane [*Platanus*], hornbeam [*Carpinus betulus*], elm, willow, ash, the sapwood of Scots, maritime [*Pinus pinaster*], and

Corsican [*P. laricio*] pines, silver fir [*Abies alba*], and hemlock [*Tsuga* sp.]. Laboratory tests demonstrated that *Mansonia* [*Achantia*] *altissima, Ocotea usambarensis, Sarcocephalus diderrichii,* and *Symphonia globulifera* possess high natural resistance to decay-producing fungi, and that *Sequoia sempervirens* is approximately as resistant as western red cedar [*Thuja plicata*].

In creosote impregnation tests of spruce a brown stain in some of the poles, associated with *Stereum sanguinolentum* [ibid., xvi, p. 146], appeared to be connected with a condition in the wood favouring absorption, and it is thought possible that the incipient decay produced by this fungus may be responsible for the high absorption occasionally obtained with this timber.

A field experiment with dipping treatments against stains and moulds on timber [loc. cit.] showed that under severe test conditions weak antiseptics, such as 5 per cent. sodium carbonate or sodium bicarbonate, had very little effect. A fair measure of control was given by certain proprietary antiseptics, but even with these it was essential to stack the timber so that rapid drying was facilitated. Experimental evidence was obtained that the development of internal stain in sycamore is probably generally due to chemical change in the cell contents, and not to the growth of staining fungi in the wood. These changes appear to take place wherever the timber is not freely exposed to the air.

In tests with proprietary anti-fungus paints [loc. cit.] none was found to be absolutely immune from all types of mould, though some were very much more resistant than ordinary white lead paint.

Lutz (L.). **Méthodes permettant de déterminer la résistivité des bois bruts ou immunisés soumis à l'attaque par les champignons lignicoles.** [Methods of determining the resistance of untreated and treated timber to attack by wood-inhabiting fungi.]—*Ann. Éc. Eaux For. Nancy*, v, 3, pp. 317–330, 2 figs., 1935. [English and German summaries. Received January, 1937.]

To determine the 'dysgenesic' [? inhibitory] power of wood preservatives the author's method is to culture any suitable fungus on Lutz's medium plus the preservative in increasing proportion and note the concentrations at which the fungus develops.

To ascertain the toxic dose of the antiseptic fragments of mycelium of the fungus are placed in tubes containing the preservative and water at concentrations ranging from the dysgenesic dose upwards and for periods varying from three hours to five days, and then cultured, after washing, on a nutrient medium. The concentrations permitting growth are then noted.

To determine the ability of treated and untreated wood to resist fungal attack the following procedure is adopted. Small blocks of untreated wood 1 by 1 by 5 cm. are soaked in water for 30 minutes, then placed on a potato slice in a culture and sterilized. Other cubes are placed in 250 c.c. water and heated to 110° C. for 10 minutes, after which they are transferred to a potato tube. The process is repeated up to 10 times, a number of pieces being set aside for testing at each washing. Parallel series are made with pieces of wood treated with preservatives. The selected fungi are introduced into each series so

prepared and the tubes kept at 20° for one month. A note is then made of the cubes which show fungal growth.

The rapidity with which the fungus destroys the wood is ascertained by submitting blocks of wood after exposure to infection for varying intervals to crushing tests and the results obtained are compared, by means of graphs, with those from any chosen wood as standard.

To determine the degree of penetration of a preservative a piece of wood measuring 25 by 22 by 7 cm. is treated with the preservative and left to dry. Test cubes, 1 cm. in each dimension, are then prepared in regular sequence and numbered according to the position occupied in the original piece of wood. Each cube is placed in a test tube, 1 c.c. of distilled water is added, and after sterilization at 120° is then inoculated, and kept at 20° for one month. Note is then made of those which show fungal growth, and a diagram made showing the cubes sufficiently and insufficiently protected by the preservative.

Montgomery (H. B. S.). **An investigation of the temperatures lethal to some wood-decaying fungi.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 293–298, 1936.

In order to obtain accurate data on the time required at certain temperatures to kill wood-decaying fungi, cultural experiments were carried out with 12 species on malt agar or small blocks of ash [*Fraxinus*: *R.A.M.*, xvi, p. 141] and Scots pine [*Pinus sylvestris*]. The one-month-old malt agar slant cultures were immersed in water maintained at the desired temperature and the tubes removed at regular intervals. From these subcultures were made and the growth noted after one month. Using the data obtained as a guide, tests were then made with the wood cultures kept moist in a glass dish for periods of over three weeks and up to two months. The blocks were placed each in a specially made water-tight rubber bag, tightly tied, and submerged in water kept at the desired temperature. One block was removed at the end of each time period, cooled, and subcultures made for determining viability.

A close correlation was observed between the results obtained on agar and on wood blocks. On both *Merulius lacrymans* was killed by 15 minutes' exposure to 40° C., *Poria vaporaria, Lenzites abietina, Pholiota adiposa* [ibid., xv, p. 68], and *Polyporus hispidus* [ibid., xv, p. 330] by 15 minutes at 55°, while *Lentinus lepideus* [ibid., xvi, p. 79], the most resistant of the fungi tested, was still living in agar cultures after 540 minutes at 60° and in wood block cultures after 30 minutes at 65°.

Tompkins (C. M.), Tucker (C. M.), & Gardner (M. W.). **Phytophthora root rot of Cauliflower.**—*J. agric. Res.*, liii, 9, pp. 685–692, 1 pl., 2 figs., 1936.

This is a full report on the authors' investigations on the root rot, caused by *Phytophthora megasperma*, of the cauliflower in California, an abstract from which has already been noticed from another source [*R.A.M.*, xv, p. 188; xvi, p. 159]. In addition to the hosts already enumerated *P. megasperma* was also found on hybrid cineraria (*Senecio cruentus*): it was further experimentally shown to be able to attack

ripe tomato fruits and potato tubers, and also to cause a light brown, mealy type of decay in apple fruits.

Masslovski (A. D.). О стерилизации почвы в парниках и теплицах. (Предварительное сообщение.) [On soil disinfection in hot and cool greenhouses. (Preliminary report.)]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 165–168, 1936.

The results of preliminary experiments carried out in greenhouses in Kharkoff [Ukraine] showed that black leg of cabbage (*Moniliopsis aderholdi*) [*R.A.M.*, xvi, p. 223] was reduced from 69·5 per cent. in the controls to an average of 3·15 per cent. in pots (each containing 4 kg. soil) to which 1 c.c. chlorpicrin [ibid., xv, p. 518] had been added. Further work is being carried on to determine the optimum dose and conditions under which the compound may be used.

Morotchkovski (S. F.). Бурая гниль корней Сахарной Свеклы, вызываемая грибом **Moniliopsis aderholdi Ruhl.** [Brown root rot of the Sugar Beet, caused by *Moniliopsis aderholdi* Ruhl.]—*Научные Зап. Сахарной Промышл., Агрон. Вып.* [*Sci. Notes Sugar Indus., Kieff, Agric. Bull.*] 2, pp. 93–101, 5 figs., 1936.

An account is given of an outbreak during the summer of 1935 of a root rot of sugar beet in two districts of the Chernigoff region [Ukraine] caused by *Moniliopsis aderholdi* [see preceding abstract], a fungus not recorded hitherto on beet in the field. In its general characters the rot was very similar to that due to *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., xiv, p. 730], but was brown instead of red. The disease, which in some places killed from 5 to 6 per cent. of the plants, was mostly confined to low-lying soils liable to waterlogging, and in one instance was found in soil that had been first broken to cultivation in 1935.

In giving a historical, taxonomic, and cultural account of *M. aderholdi*, the author states that he inclines to the retention of this name for the organism, which by some other workers is referred to *Rhizoctonia*, until its fertile stage has been established. In pure culture the fungus was shown to grow best in slightly acid media, and to give practically no growth at all at P_H 7·5. Investigations consequent on its discovery in the Chernigoff region evidenced that *M. aderholdi* is fairly widely distributed in several sugar beet-growing areas of the Ukraine, as well as in central and northern regions of the Soviet Union, where it is known to cause black leg of cabbage; it has also been recorded as causing a severe root rot of cotton in Russian Central Asia. All the evidence collected indicated that the chief source of infection is the soil, in which the fungus overwinters on various plant débris, but the organism was also isolated from sugar beet seed-clusters from diseased plants and it was experimentally shown that seedlings raised from such seed are severely attacked by the fungus.

With reference to control of the disease under field conditions, it is suggested that diseased plants should be rogued out during vegetation, and buried to a depth of at least 50 cm. Frequent tillage of affected fields, together with liming of acid soils and improved drainage might also be helpful. At harvest the diseased beets should be culled out and

sent as soon as possible to the sugar factories, and never stored together with sound roots.

ARTSCHWAGER (E.) & STARRETT (RUTH). **Histological and cytological changes in Sugar-Beet seedlings affected with curly top.**—*J. agric. Res.*, liii, 9, pp. 637–657, 13 pl., 1936.

A fully illustrated account is given of the authors' studies of the histological and cytological changes that occur in the tap- and lateral roots of sugar beet seedlings following infection with curly top virus [*R.A.M.*, xvi, p. 226]. Early primary disturbances in these organs, recognizable about three days after inoculation, were found to be limited to the pericycle and immature cambium derivatives. The affected cells and their nuclei hypertrophy; the latter may expand symmetrically, become irregular, or assume odd shapes. There was evidence of the existence of two distinct, but usually overlapping, phases in the pathological changes in the cells. The first or anabolic phase is marked by an increase in nucleolar material and chromatin, as well as by changes in the structure of the latter. With the onset of the second or katabolic phase, the nucleus begins to undergo irreversible changes, which are often characterized by dissolution phenomena in the nucleus and proteolysis in the cytoplasm, and the passage of nucleolar fragments and altered chromatin through the weakened or partially destroyed nuclear membrane into the cytoplasm. Later stages are marked either by mere quantitative reduction or by disorganization due to local or general proteolysis.

Cytoplasmic inclusions consisting of calcium oxalate and leucoplasts, which are normally present in healthy beet plants, were often found to be enormously increased in curly top beetroots; the latter, however, also contained cytoplasmic inclusions foreign to healthy cells, such as transitory nucleolar fragments and possibly greatly altered chromatin extrusions. Amorphous precipitates, greatly varying in their staining reaction, were also very common.

The anatomical changes induced by the curly top virus are the formation of hyperplastic cells, and of sieve-tube-like elements with plastids and slime bodies but without sieve plates. Bead-like protuberances of pseudo-callus appear on the walls of the sieve tubes, usually both on the lateral and cross walls, but occasionally only on the terminal walls. The cells of the supernumerary cambiums divide longitudinally and incomplete divisions are commonly observed.

CHAMBERLAIN (E. E.). **Pea mosaic. Host range and methods of transmission.**—*N.Z. J. Sci. Tech.*, xviii, 6, pp. 544–556, 8 figs., 1936.

Pea mosaic [*R.A.M.*, xv, p. 28; xvi, p. 83] is one of the commonest and most widely distributed virus diseases in New Zealand, where it attacks garden and field peas, broad beans [*Vicia faba*], red clover (*Trifolium pratense*), blue lupins [*Lupinus angustifolius*], and sweet peas.

On garden peas the first symptom is the appearance of light-coloured areas along the veins of the young leaves. This network mottling is later replaced by a more general type, in which the light areas often occur between the veins. Affected plants are stunted and pale, with

small, occasionally distorted, leaves; they flower later than healthy ones, and the pods are fewer, smaller, less well-filled, and later maturing than normal. The symptoms appear only on leaves that develop after infection has taken place. On sweet peas the characteristic symptom is leaf mottling. Stunting is slight, with little effect on the number of flowers produced, though these are streaked and pale. Under field conditions affected red clover plants are markedly stunted and pale, with dwarfed leaves.

The disease was transmitted by juice inoculations from garden peas to garden peas, blue lupins, white lupins (*L. albus*), *L. mutabilis*, and sweet peas; from broad beans to broad beans and garden peas; from blue lupins to blue lupins and garden peas; and from yellow lupins (*L. luteus*) to blue lupins. The incubation period was shortest in young, quickly growing plants, and longest on old, slowly growing plants.

Insect transmission was obtained with *Myzus persicae*, *Aphis rumicis*, and *Macrosiphum gei*, the first of which appeared to be a more efficient vector than *A. rumicis*. The incubation period varied from 5 to 24 days, according to the age, state, and growing conditions of the plant. In addition to the same hosts as those infected by juice inoculations the disease was also transmitted by insect agency to alsike (*T. hybridum*) and other clovers, black medick (*Medicago lupulina*), and *Melilotus officinalis*.

In a footnote it is stated that a mosaic of beans (*Phaseolus vulgaris*) occurs in New Zealand, but appears to be quite distinct from pea mosaic, since it could not be transmitted to peas, nor the pea mosaic to beans.

TOWNSEND (G. R.) & WEDGWORTH (H. H.). **A manganese deficiency affecting Beans.**—*Bull. Fla agric. Exp. Sta.* 300, 23 pp., 6 figs., 1936.

For over ten years beans [*Phaseolus vulgaris*] growing in certain areas in Florida where the soils have become calcareous as a result of burning or the admixture of marl have shown symptoms of manganese deficiency. The first sign of the condition is a slight loss of the green colour in the trifoliate leaves, which show a faint mottling, the tissue near the veins remaining green longer than the parts between the veins. Growth is retarded, and the affected leaves remain small. The whole leaf blade generally turns a golden-yellow in a few days, but before the chlorosis is complete, small, necrotic brown spots appear, parallel to each side of the veins, and, by the time the leaf has become yellow, form rows of stipples extending to the leaf tips and margins. Later, the under surface appears to be cupped between the veins, and the upper surface of the same areas appears water-soaked and soon breaks up. New growth from the apical bud becomes progressively slower and the buds die. Each successive leaf is smaller and more chlorotic than the preceding one, and when the bud dies, all the leaves are brown and withered. Frequently there is secondary growth from the lateral buds, but defoliation sets in, and the stems die.

Experimental evidence showed that the disease can be prevented by acidifying the soil with sulphur, or by applying manganese sulphate with the fertilizer. The application of 25 lb. manganese sulphate per

acre increased the average yield of two crops of beans from 4·6 to 109·0 hampers, and one of 50 lb. per acre to 122·5 hampers. The best and most lasting results were given by mixtures of sulphur and manganese, 50 lb. manganese sulphate and 50 lb. sulphur per acre increasing the yield to 132·3 hampers. The amount of manganese found in leaves from plots receiving the last-named treatment was 113·3 p.p.m. compared with 24·4 p.p.m. for those treated with 50 lb. manganese sulphate alone, and 9·9 p.p.m. for the untreated controls. It is suggested that the use of 25 lb. manganese sulphate and 200 lb. sulphur per acre per year will maintain normal production on badly burned soil. Good results were also obtained with manganese sulphate sprays and dusts, less than one quarter of the amount of manganese required by a soil treatment giving an equally good result when used as a spray. Two applications of a solution containing 4 lb. manganese sulphate in 50 galls. water are considered sufficient in most cases.

MATZULEVITCH (B.). Методы анализа почвы на зараженность головней Лука. [Methods of soil analysis for the detection of infection with Onion smut.]—*Pl. Prot. Leningr.*, *1936*, 8, p. 174, 1936.

It was experimentally shown that the presence in soil of spores of onion smut [*Urocystis cepulae*: *R.A.M.*, xv, p. 464] may be conveniently detected by sowing onion seed in the laboratory in suspected soil, and keeping the pots at 18° to 20° C.; in contaminated soil typical smut lesions are easily observed in 16-day-old seedlings under the microscope, the percentage infection under laboratory conditions being closely comparable to that obtained in the open in the same soil. A more direct method consists in collecting a number of soil samples from the field, thoroughly mixing them to make an average sample, of which three lots of 1 gm. each are separately shaken for 10 minutes in 3 c.c. of distilled water, this process being repeated twice; the three washings of each lot are poured together, 3 c.c. benzene are added, the whole shaken for 3 to 5 minutes, and then centrifuged; the smut spores collect as a dark-coloured deposit between the water and benzene, and are counted under the microscope in ten drops removed from the deposit by means of a pipette. It was shown that percentage infection of onion seedlings in the examined soils increased in direct proportion to the number of spores counted under the microscope.

PALO (M. A.). **The Phomopsis disease of Eggplant and its control.**—*Philipp. J. Agric.*, vii, 3, pp. 289–315, 8 pl., 2 graphs, 1936.

Heavy damage was caused in Pampanga Province, Philippine Islands, in the autumn of 1935 by *Phomopsis vexans*, the agent of leaf spot, stem canker, and fruit rot of eggplants [*R.A.M.*, xvi, p. 44], which in a field of 7,000 plants killed 64 per cent. of the fruits and destroyed 10 and 20 per cent., respectively, of the first and second harvests in transit. In 1936 another severe outbreak of the disease occurred in Nueva Ecija.

Of the two spore types produced by the fungus, the elliptical pycnospores generally develop in culture and in nature under Philippine conditions, though the filiform stylospores may be formed on dead eggplant stems in the field.

In greenhouse inoculation tests *P. vexans* was more virulent on seedlings exposed to a very humid atmosphere for protracted periods, but damping-off symptoms were only observed on seedlings grown in infected soil. Pycnidia constantly developed on the affected portions of the stems and leaves. Similarly in the field, the damp, showery weather following inoculation conduced to serious infection, the first symptoms of which were detected ten days after the operation. Of the 32 inoculated plants, 29 (90 per cent.) died of the disease during the quarter from 15th January to 18th April, 1936. The spores are disseminated by splashing rain and strong winds, on the feet of insects, and through cultural operations. Good control was secured on diseased plants by six weekly applications of 4–4–50 Bordeaux mixture, five fortnightly treatments with which prevented the development of infection of healthy stands. Other sanitary measures recommended are the use of healthy seed, which should if necessary be soaked for ten minutes in 1 in 1,000 mercuric chloride, 1 in 300 formalin, or water heated to 55° C., or for 30 minutes in water at 50°, burning the plant refuse after harvest, and triennial crop rotation.

VERONA (O.) & PASINETTI (P.). **Su di un deperimento della Lactuca sativa L.** [On a wilt of *Lactuca sativa* L.]—*Boll. Ist. agr., Pisa,* xi, pp. 364–376, 1 pl., 2 figs., 1936.

During 1934 and 1935 Olandese and Trocadero lettuces planted out during October in damp, compact soil in the vicinity of Pisa were severely affected by a wilt which destroyed up to 95 per cent. of the crop. The leaves withered up after developing spots which enlarged and became confluent, and as a rule the tap-roots showed large, cylindrical cavities at the collar. No insect or fungus was present, but affected material showed the presence of five strains of bacteria [which are described]; these include forms resembling in cultural characters, but not definitely identical with, *Bacterium vitians* [*R.A.M.*, xiii, p. 139], *Bact. viridilividum*, or *Bact. marginale* [ibid., xiv, p. 16].

Syringe inoculations in the collar of healthy lettuces with *Bact. vitians* gave positive results, the rapid and complete wilt set up by this organism confirming its pathogenicity; a complete but slower wilt was caused by the authors' strain I 2, while slight infection was produced by the authors' strain I 1, *Bact. pyocyaneum* [*Bacillus pyocyaneus*] and *Bact.* [*B.*] *fluorescens-liquefaciens* [loc. cit.] which, it is considered, may have acted as weak parasites in lettuces injured by frost.

The disease is considered to be the same as that reported by Nellie A. Brown (*J. agric. Res.*, xiii, pp. 367–388, 1918) from South Carolina [as due to *Bact. vitians*].

NISIKADO (Y.) & MATSUMOTO (H.). **On the smut disease of Sagittaria trifolia L. var. sinensis Makino caused by Doassansiopsis horiana (P. Henn.).**—*Ber. Ōhara Inst.*, vii, 3, pp. 415–427, 5 pl., 1936.

Sagittaria trifolia var. *sinensis*, the tubers of which are stated to be widely used, especially in western Japan, as a substitute for rice, is liable to infection by a smut disease characterized by the development on the leaves of yellowish or orange-yellow, irregular, ill-defined lesions, 5 mm. or more in diameter, with blackish sori in the centre, usually

produced in the subepidermal spongy parenchyma, and on the petioles of short, dark stripes. The sori measure 72 to 180 μ in diameter and produce numerous promycelia, from the ends of which (20 to 100 μ in length) are abstricted crowns of 4 to 8 (usually 5 to 6) hyaline, fusiform, long-elliptical, or cylindrical sporidia, 25 to 40 by 4 to 6 μ. The morphological characters of the organism correspond to those of *Doassansia horiana* amd *D. tokinensis* P. Henn., but the writers are of opinion that it would be more correctly placed in the subgenus *Doassansiopsis*, and the *Sagittaria* smut is accordingly renamed *D. horiana* (P. Henn.) Nis. & Mats.

The most abundant mycelial growth and sporidial production were made on potato sucrose agar, followed by apricot and malt extract agars, the colonies being generally wet, pale greyish, yeast-like, devoid of aerial hyphae, and sometimes displaying centrifugally radiating grooves. The minimum, optimum, and maximum temperatures for the development of the mycelium and reproductive organs of *D. horiana* are 10°, 30°, and 35° to 37° C., respectively. Positive results were given by inoculation tests with the smut on young, wounded leaves of *S. trifolia* var. *sinensis*.

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1934 et 1935. [Summary reports on laboratory work carried out in 1934 and 1935.]—*Ann. Epiphyt.*, N.S., ii, 3, pp. 381–422, 2 graphs, 1936.

These reports from the various agricultural research stations in France [cf. *R.A.M.*, xiii, p. 76] contain among many others the following items of interest, apart from those already noticed from other sources.

During 1934 and 1935 the Garnet, Ile-de-France, Providence, Ridit, and Warren wheat varieties grown at Versailles were resistant to *Puccinia glumarum* at all stages of their growth, and had less than 5 per cent. of leaf surface destroyed; the degree of susceptibility of a large number of other varieties is indicated.

In the south-west the rapid degeneration of certain selected seed potatoes is attributed to potato virus Y. Many potatoes, though rigorously selected, carry virus X in a latent form and inoculation of these with Y results in frisolée.

When a large number of Solanaceous hosts were experimentally inoculated with a virulent strain of *Bacterium tabacum*, no lesions appeared on *Nicotiana sanderae*, *N. affinis*, or *N. alata*, or on plants belonging to any genus other than *Nicotiana*. In Alsace the chief agents of damping-off in tobacco seed-beds are species of *Sclerotinia*, *Pythium*, and *Thielavia*. The best control was given by seed disinfection with formalin 0·5 per cent. for 45 minutes, and soil treatment with 5 per cent. formalin using 10 l. of solution per sq. m.

The dying-off of young buds of raspberries in the spring was caused by *Didymella applanata* [ibid., xv, p. 817] and a die-back of black currants and gooseberries by *Phomopsis ribis* (Magn.) Barth. [*Cytosporina ribis* Magn.: ibid., iii, p. 433].

Cylindrocarpon ehrenbergii, *Ascochyta pisi*, *Peronospora pisi* [ibid., xv, p. 194], and *Thielaviopsis basicola* [ibid., xv, p. 467] occurred in

experimental plots of peas at Sarcelles. Inoculations with five species of *Fusarium* on peas in tubes and pots gave positive results with *F. oxysporum* f. 8 [ibid., xiv, p. 613] and *F. orthoceras* var. *pisi* [ibid., xiv, p. 339].

A species of *Hainesia* and a *Pythium* obtained from wilted golf lawns were shown by artificial inoculations to be pathogenic to *Poa pratensis* *P. compressa*, *Agrostis stolonifera*, *A. dispar*, *Festuca rubra*, and *F. duriuscula*.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1935.** [Report on the work of the Phytopathological Service in the year 1935.]—*Versl. PlZiekt. Dienst Wageningen*, 83, 88 pp., 6 pl., 1936.

The following are among the many items of interest in this report, prepared on the usual lines [*R.A.M.*, xv, p. 73]. Samples of wheat attacked by *Septoria tritici* [ibid., xvi, p. 165] were received from various parts of Holland, but in no instance was the damage caused by the fungus appreciable.

A basal rot of asparagus stems, the interior of which showed a pink discoloration, was found to be due to *Fusarium culmorum* (identified by Wollenweber) [ibid., xiv, p. 735], the first record of the fungus on this host in Holland. The same authority identified the organism inducing a yellow discoloration and wilt of young red cabbages in the north as *F. conglutinans*, the agent of the disorder known as 'yellows' in the United States [ibid., xvi, p. 159]. A sample of spinach seed from the State Seed Testing Station was found to be heavily infected by the acervuli of *Colletotrichum spinaciae* [ibid., xv, p. 774], which was experimentally shown to cause a reduction of 44 per cent. in the stand.

A die-back of Gros Colman and Black Alicante vines, the latter less extensively affected, was found to be due to a *Phomopsis*, possibly the imperfect stage of *Cryptosporella viticola* [ibid., xi, p. 790], which apparently enters the stem by way of pruning wounds on the short, thick, lateral shoots. Vine leaves showing a mosaic-like spotting [ibid., xiii, p. 492] are occasionally submitted for examination.

P. mali, previously reported on apples [ibid., xv, p. 73], was observed on young espalier pears in 1935.

Oidium begoniae was found severely attacking begonia plants [ibid., xv, p. 443] at Wageningen; the leaves shrivelled, growth was arrested, and flowering abortive.

Both nursery and avenue trees of *Acer pseudoplatanus* and other *A.* spp. are liable to infection by *Nectria cinnabarina* [ibid., xvi, p. 217] which causes a serious die-back, especially of sycamores, and may even kill the trees. Effective control of the fungus was attained by spraying with 1·5 per cent. Bordeaux mixture, followed by disinfection of the lesions with carbolineum (10 per cent. in summer, 50 per cent. in winter), excision of infected tissue, treatment with carbolineum (5 per cent. in summer, 10 per cent. in winter), and when dry, with coal-tar, concluding with a final application of 1·5 per cent. Bordeaux mixture.

Keithia [*Didymascella*] *thujina* was responsible for a brown discoloration of *Thuja gigantea* [ibid., xv, p. 412], while *P. juniperovora*

caused the death of all but 10 or 15 per cent. of the junipers [ibid., xii, p. 251] imported from France to serve as stocks in grafting operations.

Notes are given on the spraying of fruit trees against diseases and pests and various other experimental activities, together with an alphabetical list of the disinfectants tested for different purposes, and the outcome of trials undertaken with them.

PEROTTI (R.). **Note fitopatologiche per gli anni 1933–35.** [Phytopathological notes for the years 1933–35.]—*Boll. Ist. agr., Pisa,* xii, pp. 233–255, 1 fig., 1 graph, 1936.

Notes are given on the fungous and bacterial diseases and insect pests attacking cereals, vegetables, fruit trees, olives, vines, and ornamentals during 1933 to 1935 in the part of Italy under the supervision of the Pisa Agricultural Institute.

SMITH (F. E. V.). **Report of the Government Microbiologist.**—*Rep. Dep. Sci. & Agric. Jamaica, 1935,* pp. 53–72, 1936.

During 1935, the total number of cases of Panama disease of bananas (*Fusarium oxysporum cubense*) reported in Jamaica reached 415,931 for all parishes excluding Portland, an increase of 56 per cent. on the total for 1934 [*R.A.M.*, xv, p. 343]. Land lost to banana cultivation is estimated at 32,000 acres, including large areas of the best alluvial land infected through the agency of flood water. The decision to permit one root treatment throughout the island was put into operation during the year.

Coco-nut bud rot due to *Phytophthora* [*palmivora*: ibid., xv, p. 343] occurred sporadically all over the island, as a result of the hurricanes experienced since 1932. Leaf disorders similar to those experienced in St. Mary [loc. cit.] have now arisen in St. Ann and Trelawny, and it is apparent that in areas where the rainfall or soil is unsuitable leaf troubles appear when the trees are upwards of 20 years old, and, unless growth can be aided by cultivation and drainage, may develop into 'pencil point' which renders the tree valueless and finally kills it.

Oleocellosis [ibid., xvi, p. 94] was very frequent in citrus fruits carelessly or tardily prepared for shipment. Stem-end rot (*Diplodia natalensis*) of citrus is now a minor problem. Knot disease (*Sphaeropsis tumefaciens*) [ibid., xii, p. 565] of lemons and limes was reported on several occasions from the north side of the island.

Pimento [*Pimenta officinalis*] rust (*Puccinia psidii*) [ibid., xv, p. 742] appeared throughout the island in 1935. The trees carry their leaves for two years, and when infection is severe defoliation of the young leaves (the only ones attacked) is caused. Both the 1934 and 1935 crops of leaves were almost entirely lost in the Manchester and St. Elizabeth area, leaving the trees practically leafless by May. Spraying is neither feasible nor economic, and the outlook for growers in the higher altitudes is unpromising.

In the section of this report dealing with cold storage investigations it is stated that Cavendish bananas [*Musa cavendishii*] shipped abroad or held in cold storage were commonly affected by stem-rot [ibid., xv, p. 451]. Experiments showed that expensive cultivation would be necessary to obtain good yields with this variety in Jamaica, and that

some protective covering would be necessary during shipment to prevent bruising. It is clear that the additional expenses involved render the Cavendish banana unprofitable to the average grower at present.

From the beginning of the experimental shipments of Jamaica Pairi mangoes in 1933 wastage has invariably occurred, reaching $33\frac{1}{3}$ per cent. in some instances, and seldom falling below 20 per cent. Stem-end rot, generally caused by *Colletotrichum gloeosporioides*, was one cause of loss.

Annual Report of the Department of Agriculture, Zanzibar Protectorate, 1935.—45 pp., 1936.

The following items of phytopathological interest occur in this report. 'Sudden death' of cloves [*R.A.M.*, xv, p. 204] entails an annual loss estimated at 7·5 to 8·75 per cent. of the stands. 'Die-back' of cloves [ibid., iii, p. 79] would appear, from the results of a nutrition deficiencies trial, to be largely due to competition with plantation grass for phosphorus and potassium salts.

None of the cassava varieties from Java and East Africa used in test plots proved to be completely immune from mosaic [ibid., xv, p. 204; xvi, p 16], but two of the Javanese gave considerable promise in comparison with the local strains. Roguing increased the yield from 9,192 to 10,748 lb. per acre.

Plant pathology.—*Rep. Hawaii agric. Exp. Sta., 1936*, pp. 33–40, 1 fig., 1936.

It is stated in the introduction to this report that the department of plant pathology has been re-established under the direction of G. K. Parris after a lapse of 16 years. During the period under review research work was concentrated mainly on taro (*Colocasia esculenta*) and tomato diseases. Taro is subject to two major corm rots, one a mushy, malodorous type of decay ('soft rot') associated with an unidentified *Pythium* (probably the same as that mentioned by Carpenter in *Rep. Hawaii agric. Exp. Sta.*, 1917–18 and that recorded by Wright in the Gold Coast [*R.A.M.*, xi, p. 763]), and with *Phytophthora colocasiae* [ibid. xiv, p. 122; xvi, p. 232], frequently accompanied in a secondary capacity by *Bacillus carotovorus*. All attempts to reproduce the typical features of the rot as observed in the field gave negative results, and the development of the disease is believed to be due to the combined action of either or both the above-mentioned weakly parasitic Phycomycetes and unfavourable soil conditions. The second disorder, known as 'internal hard rot' or 'guava seed', transforms the vascular system of the corm into a hard, woody, yellowish- to dark brown mass, useless for culinary purposes. No pathogen has been detected in the diseased tissues and the possible virus or physiological nature of the disturbance is under consideration. *Sclerotium rolfsii* also occasionally attacks taro corms [ibid., xi, p. 763], chiefly in storage. Leaf spots are caused by *P. colocasiae* and *Phyllosticta colocasiae* [loc. cit.], both of which may be destructive in cool, damp, windy weather.

The principal fungous diseases of tomato are early blight (*Alternaria solani*) and the rot due to *Phoma destructiva* [ibid., xvi, p. 69], while

a *Fusarium* wilt is sometimes severe. Mosaic is prevalent in all parts, often causing a light set of fruit. The chief physiological disorder is blossom-end rot [ibid., xv, p. 690].

Among other diseases observed on the islands of Oahu and Kauai were leaf spot of asparagus (*Cercospora asparagi*) [ibid., ix, p. 613], bean (*Phaseolus vulgaris*) leaf spots (*Phoma subcircinata* and *Phytomonas* [*Bacterium*] *phaseoli* [ibid., xvi, p. 85]), *Septoria lycopersici* on egg-plant, heart rot of lettuce (*Bacterium vitians*) [see above, p. 297], die-back of mango (*Botryosphaeria ribis*) [ibid., ix, p. 344], leaf spot of pepper (*Capsicum frutescens*) due to *Bact. vesicatorium* [ibid., xv, p. 537], and *Fusarium* [*javanicum var.*] *radicicola* [ibid., xv, p. 765] on roselle (*Hibiscus sabdariffa*).

Burgwitz (G. K.). Бактериальные болезни растений. [Bacterial diseases of plants.]—339 pp., 8 figs., Издат. Акад. Наук СССР. [Publ. Off. Acad. Sci. USSR.], Leningrad, 1936.

This is a revised and somewhat amplified edition of the author's monograph on plant pathogenic bacteria [*R.A.M.*, xv, p. 4], incorporating work published up to the beginning of 1935. The following new combinations are made: *Bact. carotae* [ibid., xiv, p. 211], *Bact. cerasi* var. *prunicola* [ibid., xiii, p. 452], and *Bact. hypertrophicans* [ibid., xii, p. 435]. *Bact. ananas* Serrano 1934 [ibid., xiv, p. 456] is renamed *Bact. serranoi* to avoid [it is stated] any confusion with *Bact. ananas* (Serrano) Burgwitz 1935 (*Bacillus ananas* Serrano, 1928) [loc. cit.]. A number of species transferred to *Bacterium* in the earlier edition are reprinted as new combinations in this text, including *Bact. croci* [ibid., ii, p. 42], *Bact. gladioli*, *Bact. heteroceum* [ibid., x, p. 628], *Bact. itoana* [ibid., xi, p. 536], *Bact. mors-prunorum* [ibid., xi, p. 379], *Bact. papaveris* [ibid., vii, p. 243], *Bact. polycolor* [ibid., x, p. 133], *Bact. rubrisubalbicans* [ibid., x, p. 129], *Bact. saliciperda* [ibid., xii, p. 61], *Bact. tracheiphilum*, *Bact. utiformica* [ibid., xi, p. 379], *Bact. viridiflavum*, *Bact. v.* var. *concentricum* [ibid., xii, p. 348], *Bact. betivorum* [ibid., x, p. 575], *Bact. cacticidum* [ibid., iii, p. 706], *Bact. phytophthorum*, *Bact. berberidis* [ibid., xi, p. 109], *Bact. citrimaculans*, *Bact. mangiferae*, *Bact. viburni* [ibid., xi, p. 110], *Bact. prunicola* [ibid., xi, p. 58], *Bact. lycopersicum*, *Bact. sorghi*, *Bact. carotovorum*, and *Bact. agropyri*.

Stapp (C.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. IV. Mitteilung: eine neue Wirtspflanze (Dahlia variabilis Desf.) mit hochvirulentem Erreger.** [Crown gall of plants and its causal organism *Pseudomonas tumefaciens*. Note IV: a new host plant (*Dahlia variabilis* Desf.) with a highly virulent agent.]—*Zbl. Bakt.*, Abt. 2, xcv, 13–17, pp. 273–283, 4 figs., 1936.

Continuing his studies on the crown gall of plants caused by *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xii, p. 680], the writer describes inoculation experiments with a strain of the organism from *Dahlia variabilis* [ibid., xv, p. 370], pure cultures of which on bouillon agar induced virulent infection not only on its own host (foliage and tubers) but also on *Pelargonium zonale* [ibid., xvi, p. 235] and Lucullus tomatoes. The wilting of the plants shortly after inoculation pointed to the

migration of the bacterium from the site of entry, a supposition that was confirmed by its detection after five weeks at a distance of 31 cm. from the place of insertion. Secondary tumours were formed as a result of reinoculation by means of sterile needles at a point widely removed from the original site of penetration. The dahlia strain of *Bact. tumefaciens* was shown by serological tests to be identical with that from *Chrysanthemum frutescens* II b.

BERTHELOT (A.) & AMOUREUX (GERMAINE). **Recherches sur la composition chimique des tumeurs de la Betterave déterminées par Bacillus tumefaciens.** [Studies on the chemical composition of the Beetroot tumours caused by *Bacillus tumefaciens*.]—*C.R. Soc. Biol., Paris*, cxxiii, 34, pp. 942–944, 1936.

There was found to be little difference in two consecutive years (1934 and 1935) between the content in dry matter of healthy beetroot (semi-sugar) tissues and those of tumours induced by inoculation with *Bacillus* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvi, pp. 161, 235], the following values being obtained: healthy 11·75 and 9·47 per cent. in 1934 and 1935, respectively, tumours (hop strain) 12·50 and 9·46, and tumours (*Anthemis* strain) 12·75 and 9·46. The saccharose, glucose, and levulose contents of the fresh pulp of healthy tissues were 5·12, 0·08, and 0·44 per cent., respectively, compared with 4·80, 0·65, and 0·69 for the hop tumours and 7, 0·55, and 0·10 for those induced by inoculation with the *Anthemis* strain. The following values were obtained for the nitrogen, potassium, and phosphorus contents (per cent. of dry matter): healthy 1·969, 0·51, and 0·213, hop tumours 2·482, 0·49, and 0·226, and *Anthemis* tumours 2·417, 0·67, and 0·229. On exposure to Schiff's reagent the distillate from the tumours (both sources) assumed a vivid pink coloration, while illumination by Wood's rays induced a bluish-green fluorescence in the tumour extracts compared with the purplish-pink tint of healthy material.

BERTHELOT (A.) & AMOUREUX (GERMAINE). **Sur la teneur en glutathion et en acide ascorbique des tumeurs de la Betterave déterminées par Bacillus tumefaciens.** [On the glutathion and ascorbic acid content of the Beetroot tumours caused by *Bacillus tumefaciens*.]—*C.R. Soc. Biol., Paris*, cxxiii, 34, pp. 944–946. 1936.

The ascorbic acid content (per 100 c.c.) of the juice of healthy beetroot (semi-sugar) tissues was estimated at 0·028 gm. compared with 0·057 for that of the extract of tissues inoculated with the hop strain of *Bacillus* [*Bacterium*] *tumefaciens* [see preceding abstract], the corresponding figures for glutathion being 0·0006 and 0·0030 gm., respectively.

HANES (THEODORA B.). **Observations on the results of inoculating cereals with the spores of cereal rusts which do not usually cause their infection.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 252–292, 18 figs., 1936.

In this study inoculation experiments [which are fully described] were carried out with the uredospores of *Puccinia triticina*, *P. glumarum tritici*, *P. anomala*, *P. coronata* [*P. lolii*], and *P. graminis secalis* on their

normal hosts and also on cereals on which they do not normally occur, and their development in the two sets of hosts compared. It was found that, in general, the relation of the host to the fungus which does not develop on it in nature is antagonistic, the mesophyll cells near the stomata of entry usually being killed. The invasion of the inappropriate hosts, however, proceeds normally at first. Exceptionally, the fungus kills the guard cells of the stomata of entry, but fails to develop further than the formation of substomatal vesicles, and the host displays no further antagonistic reaction.

P. triticina sometimes produced normal uredospore pustules on rye and occasionally minute, abortive pustules on barley. In oats, progress by *P. triticina* was negligible, and only once was a haustorium seen. *P. glumarum tritici* produced intercellular mycelia in rye and barley, but no pustules. It entered oats, but produced no mycelium. *P. anomala* initiated invasion of wheat, rye, and oats, killing the guard cells, but failing to form mycelia in the tissues. Germ-tubes of uredospores of *P. lolii* from oats entered wheat, barley, rye, *Lolium perenne*, and *L. italicum*, but usually failed to develop beyond the formation of infecting hyphae; the contiguous mesophyll cells were sometimes killed. The progress of infection by the aecidiospores of *P. lolii* from *Rhamnus catharticus* was negligible on oats, wheat, barley, and *Lolium* spp., and no uredospores were formed. The immunity of oats from the aecidiospores from *R. catharticus* indicates that this form has a host range outside the hosts experimented with. Rye plants inoculated with aecidiospores showed traces of an intercellular mycelium and haustoria, but there was an antagonistic reaction to the fungus. *P. graminis secalis* from rye and *Agropyron repens* invaded wheat, barley, and oats, and occasionally produced small uredospore pustules on barley and wheat but no development took place beyond the substomatal vesicles in oats. The fungus always formed its first haustorium in an epidermal cell adjacent to the stoma of entry.

FISCHER (G. W.). **The longevity of smut spores in herbarium specimens.** —*Phytopathology*, xxvi, 12, pp. 1118–1127, 1936.

Out of 387 herbarium specimens of 77 species of smuts tested for spore longevity, 80 representing 24 species (11 originating in countries outside the United States) were found to contain viable spores [*R.A.M.*, xvi, p. 247]. The following species were remarkable for their longevity: *Tilletia tritici* [*T. caries*] (Washington) 18 years, *T. levis* [*T. foetens*] (Kansas) 25 [ibid., iii, p. 512], *Ustilago hordei* (Montana) 23, *U. avenae* (Washington and Rhine Province, Germany), 13 and 12, respectively, *Sphacelotheca sorghi* (Washington) 13, *U. bromivora* (Washington) 10 [ibid., xv, p. 445; xvi, p. 155], and *Entyloma dahliae* (Germany) 10 [ibid., xvi, p. 18]. The considerable differences in viability noted in various collections of the same age and species are believed to be correlated with the degree of maturity of the spores at the time of collection, as suggested by Miss Sampson [ibid., viii, p. 372]; in several instances collections of fully matured spores 12 to 18 years old showed higher germination percentages than much younger ones of the same species composed of imperfectly developed material. Generally speaking, the Tilletiaceae survived for longer periods than the Ustilaginaceae.

Christoff (A.). Твърдата главня по Пшеницата въ Шуменската областъ. [Bunt of Wheat in the Shumla region.]—*Publ. Min. Agric. and Crown Lands, Sofia, 1936*, 62, 21 pp., 1 map, 1 graph, 1936. [German summary.]

This is a very fully tabulated account of the author's mycological examination of 519 samples of wheat of the 1932 and 1933 harvests from 13 districts of the Shumla region in north-east Bulgaria. The results showed that 91·33 per cent. of the samples were attacked to a greater or lesser degree by *Tilletia levis* [*T. foetens*], and 47·06 by *T. tritici* [*T. caries*], both species being simultaneously present in 40·11 per cent. of the samples; only 0·79 per cent. were entirely free from bunt. *T. foetens* is distributed throughout the region, the severity of its incidence gradually declining from the east (Black Sea littoral), where it alone is present, to the west, where the predominating species is *T. caries*. The river Danube appears to form a barrier for the westward spread of *T. caries*, since this species is only occasionally reported in Rumania, where the prevailing wheat bunt is *T. foetens*. These results, taken in conjunction with the fact that local Bulgarian wheat varieties are severely attacked by *T. foetens* and only slightly or not at all by *T. caries*, are considered to suggest that while the former species is native to Bulgaria, the latter is a recent importation from abroad, most probably with the Noah variety.

Yu (T. F.), Hwang (L.), & Tsiang (C. T.). **Varietal resistance and susceptibility of Wheats to flag smut (Urocystis tritici Koern.) III. Physiologic specialization in Urocystis tritici Koern.**—*Bull. Chin. bot. Soc.*, ii, 2, pp. 111–113, 1936. [Chinese summary.]

Continuing their studies at Nanking, China, on the varietal reaction of wheat to flag smut (*Urocystis tritici*) [*R.A.M.*, xiii, p. 752; xvi, p. 159], which in 1936 attacked at least 90 per cent. of the crops in Siao Hsien, Kiangsu, and caused up to 94 per cent. infection in 37 localities of eight provinces, the writers tabulate and discuss the outcome of four years' inoculation tests with collections of the fungus from different parts of the country on ten wheat strains. On the basis of these trials five physiologic forms of *U. tritici* are differentiated. Nanking wheat No. 716 was resistant to forms 1, 2, and 3 but susceptible to 4 and 5, No. 799 resistant to 1 and 2 but susceptible to 3, No. 793 resistant to 1 but susceptible to 2 and 3, No. 795 resistant to 4 but susceptible to 5, No. 796 resistant to all forms, and No. 800 and H. 1102 susceptible to all.

Bussmann (B.). **Untersuchungen über die Virulenz von Ophiobolus graminis Sacc.** [Investigations on the virulence of *Ophiobolus graminis* Sacc.]—*Phytopath. Z.*, ix, 6, pp. 571–581, 5 figs., 1936.

The results of experiments with 21 strains of *Ophiobolus graminis* [*R.A.M.*, xvi, p. 29] isolated from diseased wheat plants from various localities in Germany in 1931, showed that they differed considerably from one another in cultural behaviour. In general the mycelium of *O. graminis* assumes a dark colour, but certain strains developed an immersed mycelium that remained hyaline throughout. Some strains

gave a thick, cottony, black aerial mycelium, while in others it was sparse and white to grey, and in one it was distributed over the whole surface of the culture medium in small, whitish-grey tufts. Most of the strains tested failed to fructify on agar media, but a large number of these gave perithecia on straw after a few months. The capacity to produce perithecia in pure culture is apparently a distinctive feature of certain strains. Some of the strains exhibited a strong tendency to form sporidia, even from young spores.

Soil inoculation experiments of wheat in pots showed that the various strains also differed widely from one another in pathogenicity, but not in their ability to form perithecia on the host, these fructifications appearing within a comparatively short time on all plants with foot lesions. Comparative tests of strains propagated vegetatively from mycelium with others obtained from perithecia showed that the former were more virulent in five cases, the latter in two, while both were equally virulent in six. The addition of perithecia to the soil inoculum did not increase the pathogenicity of the strains, and the purely vegetative subculturing of three strains for a year did not reduce their virulence, which was maintained both in the light and in darkness. From a practical standpoint these investigations are considered to indicate that the destruction of wheat stubble bearing the perithecia of the fungus is not a sound measure in the control of the disease.

Garrett (S. D.). **Soil conditions and the take-all disease of Wheat.**— *Ann. appl. Biol.*, xxiii, 4, pp. 667–699, 1936.

Continuing his studies on wheat take-all (*Ophiobolus graminis*) [*R.A.M.*, xiii, p. 433] the author found that the organism was unable to grow through the soil or to show any activity therein except along the roots of its hosts, and was only able to spread by root contact [ibid., xiv, p. 623]. This suggests that two alternating phases must be distinguished in the life of *O. graminis* in the soil, namely, a parasitic or ascendant phase and a saprophytic or declining one; during the latter the fungus is exposed to the competition of secondary organisms which enter the wheat roots already killed in a regular succession of secondary parasites followed by saprophytes. It was experimentally shown that in the parasitic phase the rate of spread of the fungus varies widely with the soil conditions, moisture, temperature, aeration, reaction, and the like, and that its growth may even be entirely inhibited, in which case infection is non-progressive since it has been found that the fungus extends only for a few millimetres inside the roots if its external growth is stopped. The best growth along the wheat roots occurred in sand (53 mm. after 14 to 16 days at 20° C., as against 5 mm. in Slough soil), and in soil the growth was improved by any condition tending to promote better aeration, by raising the P_H value of the soil, and by steaming, except in the case of the more acid soils. A similar improvement in the soil was also brought about by formaldehyde. In the saprophytic phase, the disappearance of *O. graminis* from the soil appears to be due rather to the actual decomposition of its mycelium by saprophytic bacteria and fungi than to the absence in the soil of its host plants.

On the basis of these findings a hypothesis is suggested that in the

parasitic phase the rate of growth of *O. graminis* along the host root is related to the concentration of carbon dioxide in the soil immediately surrounding the root. In that region carbon dioxide accumulates from the respiration of the root, the hyphae of *O. graminis*, and of the soil microflora, and its dispersion will depend both on the physical nature of the soil, being more rapid in light and open soils, and on the reaction of the soil, since alkaline soils can act chemically as carbon dioxide acceptors.

In discussing control measures, it is pointed out that *O. graminis* grows on the host roots most rapidly under those soil conditions known to favour the occurrence of take-all in the field, namely, loose and open soils, soils of light texture, and alkaline soils; the controlling effect of the adverse conditions is thus considered to be exerted on the parasite itself, rather than to affect the resistance, yet to be demonstrated, of the hosts. Control, therefore, may be assisted by measures tending to compact the soil, to reduce the open character of the more sandy soils, e.g., by increasing the humus content, to lower the P_H value of the soils, and to increase the activity of the antagonistic soil microflora, e.g., by the incorporation of readily decomposable organic matter in the soil.

ADAM (D. B.) & COLQUHOUN (T. T.). **The spread of take-all through the soil.**—*J. Aust. Inst. agric. Sci.*, ii, 4, pp. 172–174, 1936.

In an experiment carried out at the Waite Institute, South Australia, in 1935, plots were prepared by replacing the surface soil to a depth of 10 in. with river sand, in one case sterilized by heating, or with the original soil sterilized. Pure culture inoculum of *Ophiobolus graminis* was introduced into the middle of the plots and covered lightly, and disinfected wheat was planted immediately above. Two weeks later other rows were planted at distances of 2, 4, 8 and 12 in., the distances between the seeds within the rows being the same as between the rows.

Examination of the mature plants showed that maximum spread in the plots with 12 and 8 in. spacing was 0 and 8 in., respectively, as against 16 and 20 in. in two plots with 4 in. spacing, and 20 in. in that with 2 in. spacing. It is evident, therefore, that the presence of living wheat roots exerts an influence on the spread of *O. graminis* through the soil [see preceding abstract].

MACHACEK (J. E.) & GREANEY (F. J.). **Studies on the control of root-rot diseases of cereals. IV. Influence of mechanical seed injury on infection by Fusarium culmorum in Wheat.**—*Canad. J. Res.*, xiv, Sect. C, 12 pp., 438–444, 1936.

Field experiments during 1932 to 1934 are recorded in which uninjured, lightly scarified, and heavily scarified Mindum and Marquis wheat seed was sown in plots artificially infected in one half with *Fusarium culmorum*. Severe root rot was successfully induced by applying mycelium and spores of *F. culmorum* to the seed and soil, and every year root rot was appreciably and significantly increased by soil inoculation. In 1933 and 1934 the difference in yield between the inoculated and uninoculated plots amounted to over 12 bush. per acre.

In all the experiments the detrimental effects of planting injured seed in soil infected with *F. culmorum* were established with a high

degree of significance. In 1932, the infected plots planted with injured seed gave 3·7 bush. per acre less than the infected plots sown with uninjured seed. In 1933, the use of severely injured seed resulted in a loss of 7·7 bush. per acre, the figure in 1934 reaching 9·1 bush. With both varieties and in all the experiments the amount of disease was increased and the yield decreased by increasing the amount of injury.

The results suggest that the large annual losses in yield caused by cereal root rots in Western Canada may be substantially reduced by sowing clean, vigorous, sound seed.

MACHACEK (J. E.). **Preliminary investigations on the effect of excessive soil salinity on the incidence of cereal root rots.**—*Sci. Agric.*, xvii, 4, pp. 215–224, 1936. [French summary.]

The author states that unusually severe attacks of root rot, caused by species of *Fusarium* and *Helminthosporium*, in 1934 and 1935 in definite areas in fields of wheat and other cereals in Manitoba were in every case found to have occurred on soils with a high concentration of soluble salts. Such areas were characterized by thinness of stand, dwarfing of the plants, absence of normal tillering, foot lesions, and early wilting and reddish-brown discoloration of the basal leaves. Magnesium sulphate is abundant in these soils and in pure culture on potato-dextrose agar *Fusarium culmorum*, *Helminthosporium sativum*, and *Pythium arrhenomanes* var. *canadensis* [*R.A.M.*, xv, p. 432] exhibited a high tolerance to concentrations of this substance ranging from 0·4 to 10 per cent., whereas barley seeds failed to germinate at concentrations of above 5 per cent., and wheat seed at concentrations higher than 3 per cent. In experiments in which barley was sown in a very saline soil (6·71 per cent. total soluble salts) and in the same soil after leaching, the former plants yielded a lower green weight than the latter, and the addition of magnesium sulphate to the leached soil caused a reduction in the green weight of barley and wheat plants, directly proportional to the amount of the salt added. In leached soil with seeds infected with *F. culmorum*, it was found that wheat (Mindum) was more susceptible to foot rot than barley, but the amount of foot rot in barley increased with the amount of magnesium sulphate added, an effect which was not observed in wheat. Lastly, in sand cultures of Mindum wheat, Victory oats, and Wisconsin Selection No. 38 barley, it was shown that high concentrations of magnesium sulphate retarded seedling growth and increased the disease rating in the seedlings produced by seeds artificially infected with *F. culmorum*. Seed germination was not seriously affected by the salt at any of the concentrations used.

CHRISTENSEN (J. J.). **Associations of microorganisms in relation to seedling injury arising from infected seed.**—*Phytopathology*, xxvi, 12, pp. 1091–1105, 1 fig., 1936.

A tabulated account is given of studies carried out at the Minnesota Agricultural Experiment Station to determine the effect of the association of a number of soil fungi, including *Trichoderma lignorum* [*R.A.M.*, xvi, p. 268], on the development of seedling blight and root rot of Minsturdi, Glabron, Manchuria, Peatland, and Wisconsin No. 38 barley

(*Fusarium* and *Helminthosporium* spp., chiefly *F. culmorum* and *H. sativum*) [ibid., xiv, p. 503].

Four methods of inoculation were used: (1) dipping or soaking the seed in a suspension of spores and mycelial fragments or extracts of the organisms, (2) pouring the suspension over the seed in the soil, (3) adding the cultures to the soil before or at the time of planting, and (4) dusting the seed with spores and mycelial fragments. The diseased seed was mostly obtained by spraying barley plants under muslin tents with various fungi, chiefly *F.* and *H.* spp.

The results of these trials do not indicate the exertion of any powerful action of the soil microflora on the disease under observation, no differences being detected in germination or extent of seedling injury when naturally infected barley seed was planted in sterilized or non-sterilized soil. Moreover, the addition of *T. lignorum* and several other fungi and bacteria to naturally infected barley seed or to sterilized or non-sterilized soil did not inhibit or retard the attacks of seed-borne parasites, while negative results also followed the immersion of infected seed in an extract of the soil organisms. However, the addition of *T. lignorum* and certain other organisms, including *Basisporium gallarum* [*Nigrospora* sp.], *Cephalothecium* [*Trichothecium*] *roseum*, *Chaetomium spirochaete*, and a bacterium, to seed or sterilized soil artificially inoculated with *H. sativum* increased the stand, diminished the number of stunted plants, and suppressed seedling injury, *C. spirochaete* and the bacterium being particularly effective in this respect. Apparently the antibiotic organisms have little or no effect on *H. sativum* and other fungi within the seed coat or seedling but are able to exert an antibiotic effect on *H. sativum* on the seed or in the soil.

It is concluded that naturally infected barley seed is one of the primary sources of seedling injury in Minnesota and should be treated with ceresan (2 oz. per bush.) before sowing to improve the stand, decrease seedling blight, and enhance plant vigour. Preliminary tests with new improved ceresan [ibid., xvi, p. 158] also gave promising results.

Aamodt (O. S.) & Platt (A. W.). **Varietal testing for the reaction of Oats to diseases, especially covered smut.**—*Canad. J. Res.*, xiv, Sect. C, 12, pp. 425–437, 1936.

As a prerequisite to breeding work varietal resistance trials were carried out in Alberta on 61 oat varieties in replicated plots for two years and 13 of the more promising varieties for a third year with a composite inoculum of *Ustilago levis* [*U. kolleri*]. The results obtained [which are tabulated and discussed] showed that the disease reactions ranged from high susceptibility (93·5 per cent. for dehulled New Era in 1934) to apparent immunity. Dehulling before inoculation increased infection approximately six times independently of the year in which the test took place, such increase being relatively greater in susceptible than resistant varieties. Throughout the tests no smut appeared on the following varieties whether dehulled or not: Markton [*R.A.M.*, xvi, p. 92], O.A.C. 144, Aurora, Awnless Monarch, Black Diamond, Black Mesdag, Cornellian, Early Ripe, Frazier, Nortex, Teck, Black Algerian, Burt, Cassel, Red Algerian, and Red Rustproof.

Marked differences were noted in varietal susceptibility to natural infection by halo blight (*Pseudomonas* [*Bacterium*] *coronafaciens*) [*R.A.M.*, xiii, pp. 156, 365] and blast (cause unknown) [ibid., xv, p. 355], the figures for the former (average of 1930 and 1931) ranging from 0·5 per cent. for Black Algerian and Red Rustproof to 25 per cent. for Victory, while those for the latter (1929 only) ranged from 0·3 per cent. in the case of Awnless Rustproof to 34·5 per cent. in that of Ferguson Navarro.

HOPPE (P. E.) & HOLBERT (J. R.). **Relative prevalence of various ear rot fungi in the 1933, 1934, and 1935 Corn crops.**—*Plant Dis. Reptr*, xx, 20, pp. 312–316, 1 graph, 1936. [Mimeographed.]

A comparison of the results of a survey of maize ear rot fungi present in samples of grain of the 1935 crop taken from carloads at terminal markets in the United States [*R.A.M.*, xiv, p. 437] with those of the two previous years' surveys showed very marked regional differences in the distribution of the fungi in given years, and equally striking differences for given regions in different years. For example, in Indiana the incidence during the three years of *Diplodia zeae* averaged 62, 21, and 4·6 per cent. and of *Fusarium* spp. (chiefly *F. moniliforme* [*Gibberella moniliformis*]) 8, 46, and 15·3 per cent., respectively. These very marked yearly fluctuations show the important effect of environment on the development of maize ear rots. The large increase in *Fusarium* spp. in 1934 as compared with 1933 was partly attributable to worm injury to the ears, *Fusarium* infection very frequently following this trouble. Owing to late planting and early frosts the 1935 crop failed generally to reach maturity, and this condition favoured infection by *Basisporium gallarum* [*Nigrospora* sp.], which greatly increased. The large increases for *G. saubinetii* in 1935 are of interest in view of an unusually heavy and widespread perithecial development of the fungus noted in the same year.

UPPAL (B. N.), KOLHATKAR (K. G.), & PATEL (M. K.). **Blight and hollow stem of Sorghum.**—*Indian J. agric. Sci.*, vi, 6, pp. 1323–1334, 4 pl., 1 graph, 1936.

In 1930 sorghum in many fields in Gujarat showed signs of early maturity and on splitting open the stalks the pith and fibres were found to be studded with sclerotial bodies of *Macrophomina phaseoli* [*R.A.M.*, xv, p. 648], not reported hitherto on this host. The following year the fungus was responsible for an epidemic seedling blight of sorghum in the East Deccan. The fungus was observed to enter the plant through feeding roots and to ascend the stem for considerable distances, even to the ear-head. No outward symptoms appeared until maturity approached, when infected plants had hollow stems, and produced a characteristic sound when shaken by the wind.

The fungus was readily and consistently isolated from diseased material and one strain from Mohol, East Deccan, produced pycnidia on sorghum seedlings in Roux tubes, with pycnospores 10 to 24 by 6 to 10 μ. The sclerotial stage measured 130 μ and 110 μ for two strains and the fungus therefore falls into Haigh's group C. In inocula-

tion experiments 6 out of 20 sorghum seedlings grown in inoculated soil showed root infection and brown discoloration at the collar, the fungus being re-isolated in pure culture. Infection was also secured on sorghum plants grown in Knop's solution in Roux tubes.

Experimental evidence demonstrated that the optimum soil temperature for infection was 35·5°C., while no disease developed at 30° or below, or at 40°. Seedling blight occurred at 35·5° and 37·5°, but was uncommon at 33°. High soil moisture was favourable to infection, the fungus becoming completely inactive when the water-holding capacity fell to 50 per cent. or under. These results confirm the general experience that the disease follows periods of heavy rain and high temperature. It is more common in clay soils than silt loams. The paper concludes with a detailed description of the cultural characters of the fungus.

NATTRASS (R. M.). **Citrus wastage trials, 1936.**—*Cyprus agric. J.*, xxxi, 2, pp. 52–56, 1936.

In a small test carried out in Cyprus, citrus fruit picked and handled with great care showed only 1·6 per cent. wastage [chiefly *Penicillium italicum* and *P. digitatum*: *R.A.M.*, xv, p. 291] 30 days after picking, as compared with 8·5 per cent. in the control lots picked and handled in the usual way.

In a further trial to check contact wastage in transit [loc. cit.] oranges were (*a*) dispatched to Covent Garden and (*b*) kept in storage locally for 25 days after being wrapped in ordinary wrappers containing 0·0127 gm. of iodine, dipped for approximately half a minute in 1 per cent. shirlan H.B. solution, enclosed in cellophane wrappers, or packed with a sheet of grease-proof paper between each two layers. The consignment to London showed on arrival 3·91, 3·84, 15, and 18·1 per cent. wastage for the four treatments, respectively, the wastage on 477 untreated cases of the consignment amounting to 8·37 per cent. In the locally stored fruit the percentage wastage given by the iodized wrappers, shirlan, and cellophane wrappers was, respectively, 2·8, 2·4, and 12·8 per cent., as against 7·6 per cent. in the controls, these figures agreeing closely with those obtained in London.

A larger trial was then made in which the fruits were dipped in 1 per cent. shirlan water-soluble powder with 0·25 per cent. agral added, or enclosed in wrappers containing approximately 0·015 gm. iodine. On arrival in London the wastage given by these treatments was 0·44 and 0·61 per cent., respectively, as against 2·53 per cent. in the controls. The selling qualities of the fruit were unaffected by the treatments. In the consignment stored locally, the same treatments gave 0·38 and 1·5 per cent. wastage, as against 4·1 per cent. in the controls, while another lot of fruit enclosed in iodized cellophane wrappers and similarly stored showed no wastage, as against 2·5 per cent. in the controls. The improved results given by shirlan as compared with those of the previous trial are attributed to improved methods of dipping and the incorporation of the wetting agent. From these trials it appears that until refrigerated ships and precooling plants are available a shirlan dip may be recommended to prevent the heavy losses that at present occur during shipment.

Baker (R. E. D.). **Notes on Trinidad fungi. I. Phytophthora.**—*Trop. Agriculture, Trin.*, xiii, 12, pp. 330–332, 4 figs., 1936.

In these notes on species of *Phytophthora* (identified by S. F. Ashby) on citrus and cacao in Trinidad it is stated that the form of *P. palmivora* attacking citrus [*R.A.M.*, xvi, p. 169] very rarely causes gummosis but is found fairly regularly producing a fruit rot of grapefruit. Nearly all the citrus gummosis found locally is due to *P. parasitica*, which was also isolated from citrus and cotton seedlings affected by damping-off. An allied form from black shank tobacco may be *P. parasitica* var. *nicotianae*.

A *Phytophthora* strain of the *P. arecae-meadii* group, 'strain C', was obtained on several occasions from cacao pods in the course of studies made to determine the true cause of cacao black pod. Out of 663 diseased pods examined 356 were infected by the typical cacao strain of *P. palmivora*, 22 by strain C, and the remainder by *Botryodiplodia theobromae* (32), *Dothiorella* [*Botryosphaeria*] *ribis* (121), *Ceratostomella fimbriata* (14), *Colletotrichum gloeosporioides* (31), and unidentified species of *Colletotrichum*, *Phomopsis*, and *Fusarium*. The collective damage wrought by the other fungi is insignificant in comparison with that caused by *P. palmivora*. The strain C sporangia are produced sympodially as in *P. palmivora*, but differ from those of the latter fungus in that they are formed on much longer pedicels and have a much greater length to breadth ratio; the zoospores also remain motile much longer (at least an hour at 22° C.) than those of *P. palmivora*. Inoculations showed that the strain C zoospores can infect unwounded cacao pods.

Fawcett (H. S.) & Klotz (L. J.). **Protection of Citrus fruits and foliage from brown rot.**—*Calif. Citrogr.*, xxii, 2, pp. 64–65, 1 fig., 1936.

Recent investigations are stated to have shown that citrus brown rot in California [*R.A.M.*, xv, pp. 89, 482] may be caused by at least four species of *Phytophthora*, viz., *P. citrophthora*, *P. parasitica*, *P. hibernalis* [ibid., xvi, p. 169], and *P. syringae* [ibid., xiv, pp. 264, 637].

Preventive treatment in the orchard (if cyanide fumigation is not used until after a normal rainy season or, better, after two rainy seasons) consists in spraying the ground and the branches up to a distance of 3 ft. with Bordeaux mixture 6–6–100 or a commercial copper sulphate and lime mixture with an equivalent strength of copper. If cyanide fumigation is effected a substitute formula is 12 lb. zinc sulphate, 1 lb. copper sulphate, and 6 lb. hydrated lime per 100 galls. water. Dusting the lower part of the tree with dry Bordeaux powder between October and December has also given promising results.

To prevent spread in the packing house any one of the following washing treatments may be used: (1) in water at 115° F. or over for at least 2 minutes, (2) sodium carbonate (soda ash) or trisodium phosphate ($1\frac{1}{4}$ per cent.) for 2 to 4 minutes, or (3) copper sulphate ($1\frac{1}{2}$ lb. per 1,000 galls. water) for 2 to 4 minutes.

Ruggieri (G.). **Esperienza sull' autogamia del Limone.** [Experiments on the autogamy of the Lemon.]—*Nuovi Ann. Agric., Roma*, xvi, 4, pp. 318–320, 1936.

Experimental evidence is adduced showing that the Monachello lemon, a variety resistant to mal secco (*Deuterophoma tracheiphila*) [*R.A.M.*, xiv, p. 680] is self-fertile and that the Interdonato variety [ibid., xv, p. 360] only yielded seedless fruit on selfing.

Bartholomew (E. T.). **Endoxerosis of Lemon fruits as affected by the application of different amounts of irrigation water.**—*Phytopathology*, xxvi, 12, pp. 1149–1154, 1936.

In a study at Riverside, California, on the relation of the moisture content of the soil to the incidence of endoxerosis (internal decline) of lemons [*R.A.M.*, xiv, p. 520], three groups of four Eureka trees each were grown in tanks with a moisture equivalent of 11 per cent. and a wilting point of 3·5 to 4 per cent. During the first stage of the experiment (January, 1929, to May, 1931) all the trees were given like amounts of water, while subsequently (June, 1931, to December, 1934) they were not irrigated until the soil in the tanks had attained a moisture content of 6 to 8, 5 to 6, and 4 to 5 per cent. in groups (1), (2), and (3), respectively, when sufficient water was applied to bring the entire mass up to 11 per cent., i.e., 47,677 galls. in all in group (1), 44,920 in (2), and 38,545 in (3). The trees in group (3), receiving the fewest irrigations and the smallest quantity of water, produced the maximum output of endoxerotic fruit, while those of group (2) bore the largest number of healthy lemons. The results of these tests confirm those of earlier trials [ibid., viii, p. 169] as to the importance of the withdrawal of water from the fruits during very hot, dry periods in the development of endoxerosis.

Haas (A. R. C.). **Deficiency chloroses in Citrus.**—*Soil Sci.*, xlii, 6, pp. 435–443, 3 pl., 1936.

A study was made of the chloroses induced in citrus trees in sand, soil, and solution cultures by a deficiency of manganese, sulphate, and magnesium. Manganese deficiency in Valencia oranges was accompanied by a chlorotic foliar spotting which is common in the field in California where the calcium carbonate supply is excessive. A shortage of sulphate results in a gradual yellowing of the leaves, the veins remaining green until the last phase is reached. Magnesium deficiency is first manifested by a yellow stripe on either side of the dark green midrib, followed by general bronzing. A knowledge acquired in the laboratory of the symptoms corresponding to certain mineral deficiencies has been found helpful in the diagnosis of physiological disorders in the field [cf. *R.A.M.*, xvi, p. 170].

Haas (A. R. C.). **The growth of Citrus in relation to potassium.**—*Calif. Citrogr.*, xxii, 1, pp. 6, 17; 2, pp. 54, 62, 14 figs., 1936.

When budded Valencia oranges were grown experimentally in sand cultures deficient in potassium the mature leaves became scorched, gum exudation commonly occurred from the leaves and trunks, many twigs died, and most of the fruits were lost before they reached maturity. The leaves showed resinous spots on both surfaces, similar leaves

occasionally being noted in the field. Grapefruit trees behaved like the Valencia orange, while lemon trees developed a yellowish or bronze discoloration on parts of many of the leaves and, as the new growth started, some of the mature leaves became burnt or scorched at or near the tip. The formation of gum deposits was observed on and within the leaves and in the cambium and phloem regions of the bark. Normal growth of lemon cuttings took place in potassium concentrations above 0·75 parts per million.

Bliss (D. E.). **Rhizosis, a recently discovered disease of Date Palms.**—*Thirteenth Ann. Rep. Date Grs' Inst., 1936*, pp. 4–6, 1936.

Between 1933 and 1935 the author examined 21 date palms in ten different gardens in California affected by a new root disease, termed 'rhizosis'. The first symptom is usually the death of the oldest leaves. The pinnae turn brown at the tip, necrosis progressing rapidly towards the trunk. The fruit stalks wilt, and many fruits may fall from the strands, while others are shrivelled or stunted. A characteristic symptom that occurs after many of the older leaves have died is the death of the youngest leaves in the crown. When all the leaves are dead the trunk bends slowly to one side as decay descends from the terminal bud.

Dissection of a Deglet Noor palm in an early stage of the disease showed that 20 to 50 per cent. of the roots when cut at a distance of 1 ft. from the trunk were brown and dead. It was apparent that necrosis had originated at some distance from the base of the palm and had advanced inwards towards the union of the root with the trunk. The xylem vessels of the necrotic root tissue were plugged with fungal spores and hyphae, numerous fungi being isolated. At first, *Phomopsis phoenicicola* and *Diplodia phoenicum* were thought to be causal agents, as they were so commonly present, but seedling palms grown in soil artificially inoculated with these fungi, singly and in combination, remained uninfected. One fungus highly pathogenic in inoculation tests was identified tentatively as a species of *Ceratostomella*, of which the imperfect stage appeared to belong to *Chalaropsis*, but to be distinct from *C. thielavioides* [*R.A.M.*, xiv, p. 801]; this fungus killed some seedlings in 20 days, and other evidence obtained strongly suggested that it is the primary cause of the condition. Preliminary experiments indicate that the fungus is comparatively resistant to certain soil fungicides, and no control methods have yet been devised.

Méndez (R.). **Algunas enfermedades del Cafeto.** [Some Coffee diseases.] —*Rev. agric. Centr. nac. Agric.*, i, 11–12, pp. 269–279, 5 figs., 1936.

Notes are given on the symptoms, etiology, distribution, and control of *Stilbella* [*Omphalia*] *flavida* [*R.A.M.*, xiv, p. 397], *Cercospora coffeicola* [ibid., xvi, p. 171], *Rosellinia* sp. [ibid., xiv, p. 397], and *Corticium koleroga* [ibid., xv, p. 345] affecting coffee in Costa Rica.

Shaw (L.). **Cotton diseases in North Carolina during the season of 1936.** —*Plant Dis. Reptr*, xx, 22, pp. 347–384, 1936. [Mimeographed.]

The treatment of cotton seed against damping-off [chiefly *Glomerella*

gossypii and *Corticium solani*: *R.A.M.*, xvi, p. 173] on 67 farms in North Carolina in 1936 with 2 per cent. ceresan reduced the average percentages of infection and death from 78 to 10 and from 9 to 1, respectively, increased the average numbers of plants emerging and standing at picking time per 100 ft. of row from 248 to 416 and from 106 to 137, respectively, and augmented the average yield and value of lint and seed per acre from 1,295 to 1,548 lb. and from $68.36 to $81.71, respectively. Using these figures as a basis, it computed that on the 891,000 acres planted with untreated seed in the State during the 1936 season, damping-off caused a reduction in yield of some 133,650,000 lb. of seed cotton, valued at about $7,056,720. Notes are also given on three other cotton diseases.

FAWCETT (G. L.). **Notas sobre algunas enfermedades del Algodonero.** [Notes on some Cotton diseases.]—*Circ. Estác. exp. agríc. Tucumán* 52, pp. 3–8, 4 figs., 1936.

Popular notes are given on *Bacterium malvacearum*, *Cercospora gossypina* [*R.A.M.*, xiv, p. 629], and two forms of root rot affecting cotton in the Argentine, one caused by an undetermined Hymenomycete with white hyphae furnished with clamp-connexions, and the other by a *Rhizoctonia* forming a typical chestnut or purple layer over the invaded areas. None of the diseases is of much economic importance under local conditions.

VOLF (F.). **Onemocnĕni kaprů plisni—Mucophilus cyprini Plehn.** [A disease of the Carp caused by the mould *Mucophilus cyprini* Plehn.]—*Zem. Arch.*, xxvii, 5–6, pp. 297–303, 3 figs., 1936.

A brief account is given of two outbreaks of disease among carp in Czecho-Slovakia, the first of which occurred in the month of July [year not indicated], and caused a loss estimated at round about 3,000 out of a total population of over 32,500 carp bred in a lake, and the second occurred in February and killed 130 individuals, weighing from 1 to 2 kg. each, in a sheet of water into which carp had been released during the preceding January. Isolations from the diseased tissues showed that the disease was caused by *Mucophilus cyprini*, first described by Mme Plehn (*Zbl. Bakt.*, Abt. 1, lxxxv, 1921) as a species of the Chytridiaceae, but referred in 1935 by Schäperclaus to the algae. The author, however, accepts the original identification, and describes the fungus as a one-celled mould, 60 to 70 μ in diameter, which develops on the epithelial cells of the gills, and kills the fish by interference with their respiration, without exerting any toxic action. None of the other fish present in the same waters was affected by the trouble.

MALEVICH (O. A.). Новый вид галофильной плесени с соленой рыбы: **Oospora nitinskii n.sp.** [A new species of halophile mould isolated from salted fish: *Oospora nitinskii* n.sp.]—*Микробиол.* [*Microbiol.*] v, 6, pp. 813–817, 3 figs., 1936. [English summary.]

Russian and English diagnoses are given of *Oospora nitinskii* n.sp., isolated from the surface of salted fish. Two strains of the organism were differentiated, one characterized by echinulate, brown conidia, 6·5 to 11 μ (average 7 μ) in diameter, abstricted in chains of 14 to 40

(usually 25 to 30) from straight, simple conidiophores, 21 to 32 μ in length, and growing exclusively on media containing 5 to 35 per cent. sodium chloride or 10 to 80 per cent. sugar (optimum temperature 24° to 26° C.), while the other differs in its smaller (4·2 to 7 μ), smooth conidia and capacity to grow equally well with or without salt.

ÖRÖSI-PÁL (Z.). **Über die Melanosekrankheit der Honigbiene.** [On the melanosis disease of the Honey Bee.]—*Z. Parasitenk.*, ix, 1, pp. 125–139, 4 figs., 1936.

An intensive study of melanosis of honey bees [*R.A.M.*, xiii, p. 440] in Hungary revealed its occurrence among workers as well as queens, the causal organism, *Melanosella mors apis* n.g., n.sp., being detected in the intestines under natural conditions and also causing heavy mortality in the workers used in inoculation experiments (feeding with pure cultures). The fungus, which is described in German only, is characterized by pale hyphae, 1·6 to 5·8 μ in diameter, yellow to yellowish-brown, oval oidia, 1·8 to 11·9 by 1·4 to 5 μ, yeast-like cells, 3·1 to 14·7 by 1·5 to 5·2 μ, and dark brown, circular or oval, unicellular (occasionally uni- or biseptate) chlamydospores up to 13 by 10 μ (average 5 to 8·7 μ). Both oidia and chlamydospores also present a concatenate type of formation. Good growth was obtained on plum decoction agar (cultures on which provided the basis for the foregoing diagnosis) and other media; gelatine is liquefied by the fungus, milk coagulated, arabinose, xylose, maltose, and lactose utilized without production of gas, a trace of acid being formed from maltose only; there is no appreciable reduction of nitrates and neither indol nor hydrogen sulphide is formed, but catalase is evolved from liquid carbohydrates.

DAVIDSON (A. M.) & GREGORY (P. H.). **The dermatophytes of Manitoba, Canada.**—*Delib. Congr. derm. int.*, ix, 1, pp. 724–731, 9 figs., 1935. [Received January, 1937.]

This revised, annotated list of human ringworm fungi [*R.A.M.*, xii, p. 23] incorporating records made in two hospitals in Winnipeg from 1930 to 1934, includes *Microsporon audouini* (54 patients), [ibid., xvi, p. 253], *M. felineum* (including *M. pubescens*) [loc. cit.] (49), *M.* sp. (34), *Trichophyton violaceum* [see next abstracts] (4), *T. gypseum* [loc. cit.] (10), *T. interdigitale* (8), *T. megalosporon* group (including *T. album*) [ibid., xv, p. 580] (34), *Epidermophyton cruris* [*E. floccosum*: ibid., xvi, p. 253] (5), *Achorion schoenleini* (5), *Pityrosporon malassezi* [ibid., xiv, p. 193] (occurring on the scalp of almost every adult patient examined), *Monilia* [*Candida*] *albicans* [ibid., xvi, p. 254] (4), *Malassezia furfur* [ibid., xv, p. 803] (regularly found in cases of pityriasis versicolor), and *Nocardia minutissima* (*Microsporon minutissimum*) (3 patients).

CATANEI (A.). **Caractères de cultures de champignons de teignes provenant de cheveux parasités prélevés depuis longtemps.** [The characters of cultures of ringworm fungi derived from parasitized hairs removed a long time previously.]—*C.R. Soc. Biol., Paris*, cxxiii, 36, pp. 1124–1125, 1936.

Ringworm hairs after six months in the laboratory produced on Sabouraud's agar whitish, velvety colonies, surrounded by a yellowish

band, without spores or spindles, the last-named being formed in profusion, however, in cultures from hair just after removal. The organism concerned is believed to be *Microsporon felineum* [see preceding abstract]. In another case a *Trichophyton* from hair kept 16 months, which commenced by forming non-pigmented colonies, gradually regained the normal purple coloration characteristic of *T. violaceum* [ibid., xv, p. 579; xvi, pp. 40, 253]. The characters associated with pleomorphism in this group of fungi may thus connote the use of old material for cultural purposes.

CATANEI (A.). **Les teignes à Alger.** [Ringworms at Algiers.]—*Bull. Soc. Path. exot.*, xxix, 10, pp. 1038–1042, 1936.

Parasitological studies of ringworm among the juvenile population of Algiers extending over the last ten years showed that, as in other parts of Algeria, the agents of trichophytosis of the scalp are more varied in the European than in the native sections of the community, being represented in 18 cases in the former by *Trichophyton glabrum* (7), *T. violaceum* (6) [see preceding abstract], *T. acuminatum* (4) [*R.A.M.*, xv, p. 501], and *T. umbilicatum* (1), and in 151 in the latter by *T. glabrum* (125), *T. violaceum* (25), and *T. fumatum* (1). *Microsporon canis* (*M. felineum*) [see preceding abstracts] was responsible for 11 cases of microsporosis of the scalp, *Achorion schoenleini* for 82 of favus (79 of the scalp and 3 of cutaneous sites), and *Ctenomyces* [*T.*] *mentagrophytes* [*R.A.M.*, xvi, p. 253] for single cases of trichophytosis of the shoulder and kerion of the forearm.

FOLEY (H.), PARROT (L.), & CATANEI (A.). **Sur un cas de teigne cutanée à Trichophyton violaceum chez un indigène adulte en Algérie.** [On a case of cutaneous ringworm due to *Trichophyton violaceum* in an adult native of Algeria.]—*Arch. Inst. Pasteur Algér.*, xiv, 2, pp. 424–425, 1936.

In 1936 the writer examined a case of cutaneous ringworm due to *Trichophyton violaceum* [see preceding abstracts] in a 30-year-old negro in southern Oran, this being the first record of the fungus in question on the skin of an adult in Algeria, notwithstanding its wide distribution as a pathogen of the juvenile scalp.

LAMSON (R. W.) & ROGERS (E. L.). **Skin hypersensitivity to molds: an attempt to correlate this with clinical allergy.**—*J. Allergy*, vii, 6, pp. 582–589, 1936.

Skin hypersensitivity by intracutaneous test to a glycerine buffer extract of moulds [cf. *R.A.M.*, xvi, p. 178] was detected in 154 out of 1,259 patients (12 per cent.), who gave 333 positive reactions to 9 species (*Alternaria*, *Chaetomium*, *Aspergillus fumigatus*, *A. glaucus*, *A. nidulans*, *A. niger*, *Monilia* [*Candida*], *Mucor plumbeus*, and *Penicillium chrysogenum* [ibid., xiii, p. 304]). Of this group, 13·6 per cent. reacted to no stock allergen. Reactions to *Alternaria* exceeded those for any of the other moulds, the next in order of frequency being *Chaetomium* and *Aspergillus fumigatus* (20, 15·9, and 12 per cent., respectively). The incidence of sensitivity did not appear to be correlated with sex,

but age is evidently a decisive factor in the development of the condition, 75 per cent. of the susceptible individuals being under forty.

Sartory (A.), Sartory (R.), Meyer (J.), & Walter. **Une dermatomycose tropicale causée par un champignon levuriforme : Geotrichoides lambarenensis.** [A tropical dermatomycosis caused by a yeast-like fungus: *Geotrichoides lambarenensis*.]—*Ann. Inst. Pasteur*, lvii, 5, pp. 526–544, 8 figs., 1936.

From the squamae of a case of dermatomycosis (the material supplied by Prof. Schweitzer of the Lambarene Hospital, French Equatorial Africa) the writers isolated a fungus with the following characters. The branched, septate hyphae, less than 1 μ in diameter, are capable of breaking up readily into fragments or in certain conditions to form coremia. Reproduction is effected by blastospores and arthrospores. The former are oval or elliptical and able to multiply by budding to form chains, or irregular and furnished with a double wall; the latter differ from the former in staining readily and by germinating to form elongated hyphae bearing blastospores. Pediculate blastospores were also observed. The polymorphism shown by the fungus is so pronounced that the authors attach great importance to physiological criteria in referring it to *Geotrichoides* as a new species, *G. lambarenensis* [without a Latin diagnosis].

On solid media the colonies are viscous at first and later develop a membranous veil, the colour of which ranges from white to mahogany-brown according to the substratum; on liquid media the veil is more or less rudimentary. The proteolytic properties of the yeast in relation to gelatine, casein, serum, and albumin are very pronounced. Glucose, levulose, galactose, and maltose were extensively utilized, particularly the last-named, while saccharose and lactose were less favourable for the growth of the organism, which developed equally well throughout the range from 27° to 37° C. and was not appreciably impaired by a temperature of 42°. Subcutaneous inoculations on guinea-pigs gave positive results.

Moore (M.). **Un nuevo tipo de blastomicosis producido por Paracoccidioides cerebriformis n.s.** [A new type of blastomycosis produced by *Paracoccidioides cerebriformis* n.sp.]—*Arch. urug. Med.*, viii, 3, pp. 224–225, 1936.

Paracoccidioides cerebriformis n.sp., isolated from blastomycotic material preserved in the collections of da Fonseca and Almeida at the Oswaldo Cruz Institute [Rio de Janeiro] and San Paulo, Brazil, respectively, is stated to differ in various respects from *P. brasiliensis* [*R.A.M.*, xv, p. 503]. In the tissues or pus the organism attains a diameter of 3 to 30 μ and occurs in the shape of spherical or ovoid, double-walled elements with simple or multiple buds, giant cells resembling those of *Coccidioides immitis* sometimes being also present. Good growth is made on various media at 25° C., the colonies on peptone agar assuming a cerebriform or vermicular aspect and those on beer wort agar forming creamy to pale yellow colonies. The hyphae are 2 to 7 μ in diameter, with numerous short, thick protuberances, and are composed of arthrosporoid, oidioid, or cross bar-shaped cells, the

chlamydospores are spherical, elongated, piriform, or sclerotic, intercalary, lateral, or terminal, and measure up to more than 15 μ in diameter, and the lateral, spherical or piriform conidia are 3 to 10 μ in diameter. The fungus neither liquefies gelatine nor ferments carbohydrates, but slightly acidifies litmus milk. Incubated at 37° the colonies of *P. brasiliensis* are readily distinguishable from those of *P. cerebriformis* by their cottony consistency and more luxuriant growth. The two fungi further differ in their clinical manifestations, though both enter the system through the mouth, those associated with the new species being seldom or never generalized to the same extent as the symptoms arising from infection by *P. brasiliensis*; they are chiefly localized in the buccal cavity, while the maxillary, sub-maxillary, and parotid glands may ultimately be invaded with fatal results.

Rolet (A.). **La pourriture des oignons à fleurs, bulbes, tubercules, rhizomes.** [The decay of flowering bulbs, corms, tubers, rhizomes.] —*Vie agric. rur.*, xxv, 24, pp. 381–384, 1936.

A popular account is given of some diseases affecting flowering bulbs, corms, tubers, and rhizomes in France, with recommendations (based on well-known authorities) for their control by cultural measures and bulb and soil disinfection. Among the fungi listed may be mentioned *Thielavia* [*Thielaviopsis*] *basicola* on begonias and cyclamens [*R.A.M.*, xv, p. 536], *Sclerotinia libertiana* [*S. sclerotiorum*] on dahlias [ibid., xv, p. 370], and *Rosellinia necatrix* on peonies. Various bacteria are also enumerated, including the agent of soft rot of gladioli and *Ixia maculata* [*Pseudomonas gladioli*] and *P. hyacinthi* on hyacinth [ibid., xv, p. 395].

Gregory (P. H.). **The control of white mould disease of Narcissus.**—*J. Minist. Agric.*, xliii, 9, pp. 865–869, 2 figs., 1936.

Narcissus white mould (*Ramularia vallisumbrosae*) [*R.A.M.*, xiv, p. 366] assumes epidemic proportions only in the south-west of England. The foliage may wither completely a month before the normal time of ripening off, and direct loss of flowers may be caused in late varieties when the stalks are attacked. The most severely affected varieties are Golden Spur, Sunrise, Ornatus maximus, and Double White, while King Alfred, Emperor, Maximus superbus, Henry Irving, Bath's Flame, and Polyanthus show some resistance. The bulbs are not affected. From February to May the fungus is carried from plant to plant principally by wind- and rain-borne spores, which germinate rapidly in moist, but do not survive in dry, weather. During the summer and autumn the fungus persists on withered leaves as sclerotia, from which spores are produced soon after the narcissus shoots appear in winter. Control consists in careful sanitation, the planting of susceptible varieties as far apart as possible, and spraying with Bordeaux mixture (4–3–40) plus a wetting agent. The first spray should be given when the shoots are 3 to 6 in. high, and one or two more at monthly intervals should suffice.

Preston (N. C.). **The parasitism of Myrothecium roridum Tode.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 242–250, 2 pl., 1936.

In the summer of 1932 the author observed the sporodochia of a

Myrothecium closely resembling *M. roridum* [*R.A.M.*, xiv, p. 428; xv, p. 157] on the basal parts of shoots of dead pansies (*Viola*).

Ninety-one inoculations with a spore suspension of the fungus on unwounded internodes and leaves of 16 plants of Maggy Mott and Chantryland violas gave 64 successful infections; inoculations through wounds all yielded pronounced lesions in eight days. When detached shoots of *V. cornuta* were inoculated, 61·8 and 91·4 per cent. of the inoculated internodes and leaves, respectively, became infected. Basal rot developed in rooted cuttings or seedlings inoculated by pouring spore suspensions down the lower part of the stem. The fungus was re-isolated from inoculated plants.

M. roridum is characterized in culture by hyaline to pale brownish hyphae, and straight, continuous, greenish or pale olive spores (jet-black in the mass), with rounded ends, measuring approximately 7 to 8 by 2 μ. It grows well at room temperature, producing a flocculent growth of pure white aerial mycelium. Sporodochia usually develop in abundance; when separate they appear as jet-black dots surrounded by a white rim, but they often coalesce into larger masses, and may form an almost continuous black line round the margin of the culture.

The lesions produced in inoculated viola leaves or stems appear as dark purple-black spots or streaks, which gradually enlarge. The tissues at the centre of the lesions dry up, shrivel, and turn brown, and the outer margin is sharply delimited from the normal green of the leaf by a deep purple-black band. The fungus must be regarded as a potential parasite under natural conditions.

Allen (Ruth F.). **A cytological study of Erysiphe polygoni on Delphinium.**—*J. agric. Res.*, liii, 11, pp. 801–818, 8 pl., 1936 (issued 1937).

In this detailed cytological study of *Erysiphe polygoni* on *Delphinium* [*R.A.M.*, xiii, p. 460] the author states that the vegetative cells are uninucleate and in sexual reproduction the hyphae swell toward each other, forming broad areas of contact, followed by nuclear transfer, the formation of special sexual cells being a matter of expediency rather than necessity. In no case did the two hyphae concerned originate on the same individual and it is probable, although not proved, that heterothallism exists in this species, as in the sunflower mildew (*E. cichoracearum*) [ibid., xv, p. 232].

Pape (H.). **Ueber die neue Bakterienkrankheit der Begonien.** [On the new bacterial disease of Begonias.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 49, pp. 583–584, 1 fig., 1936.

Begonia leaves affected by the new bacterial disease [*R.A.M.*, xv, p. 808] show predominantly marginal, ill-defined, yellowish-green areas covered on the under surface with minute, dark green, glassy spots, mostly arranged in rows along the fine veins and sometimes coalescing. The diseased tissues die and shrivel, turning a vivid fawn colour, and at this stage the dark spots are also visible on the upper surface, accentuating the veins. Ultimately the entire leaf blade may be involved and killed, while infection may also extend to the petioles and stems, causing discoloration and collapse. The whitish bacterial

exudate from the diseased tissues is apparent to the naked eye under humid conditions. Brief notes are given on two other begonia diseases with which the foregoing might be confused, viz., grey rot (*Botrytis cinerea*) and mosaic [ibid., xi, p. 768].

LACEY (MARGARET S.). **Studies in bacteriosis. XXIII. Further studies on a bacterium causing fasciation of Sweet Peas.**—*Ann. appl. Biol.*, xxiii, 4, pp. 743–751, 1 pl., 7 figs., 1936.

The author states that four strains of the bacterium causing fasciation of sweet peas [*Phytomonas fascians*: *R.A.M.*, xv, p. 723; xvi, p. 102] were isolated from a leafy gall on *Nicotiana glutinosa*, from asparagus galls, from an abnormal growth on *Heuchera sanguinea*, closely resembling the 'cauliflower' disease of strawberries, and from a large gall on a *Gladiolus* corm, all of which produced fasciation on inoculation into sweet pea seedlings. A detailed account is given of histological studies of the inoculated seedlings from two to eleven weeks after inoculation, the results of which showed that abnormal growth occurred in the hypocotyl region. In certain areas bacterial zoogloea formed a film on the outside of the tissue, and some penetration of the bacteria into the epidermal cells, and later into the intercellular spaces, was observed. It was experimentally shown that surface sterilization in 1 in 1,000 mercuric chloride for 5 minutes destroyed nearly all the bacteria, this confirming the conclusion drawn from reisolation experiments and from microscopical examination that the bacterium is mainly restricted to the exterior of the tissue, as described by Robinson and Walkden [ibid., iii, p. 15] for *Bacterium tumefaciens*.

SNYDER (W. C.) & THOMAS (H. R.). **Spotted wilt of the Sweet Pea.**—*Hilgardia*, x, 8, pp. 257–262, 1 pl., 1936.

Sweet peas in the coastal regions of California are frequently affected with a streak disease caused by the tomato spotted wilt virus [*R.A.M.*, xvi, p. 134]. Reddish-brown to dull purple necrotic streaks appear on the stems and petioles, and the leaves and shoots may turn yellow and die. Oval to circular, yellow spots with diffuse margins and usually 5 to 15 mm. long appear on the leaves, later becoming brownish and forming a pattern typical of the virus on other hosts. Some of the blossoms develop a circular pattern in the pigment, the virus being recoverable from such material. Plants infected early may turn yellow and die without showing any other symptoms, while, in other cases, the virus may be limited to local lesions.

The virus was transmitted by juice inoculations by the carborundum method from naturally infected sweet peas to *Nicotiana glutinosa*, tobacco, *Datura stramonium*, tomato, and sweet pea, from tomato showing typical spotted wilt symptoms to sweet pea, and from naturally infected romaine lettuce (*Lactuca sativa* var. *longifolia*), grown near the greenhouse where the disease was found, to sweet pea. The disease was also observed spreading rapidly in fields of head lettuce (*L. sativa* var. *capitata*).

Garden peas showing streak symptoms were occasionally found in the field, and juice inoculations from such plants gave spotted wilt symptoms on *N. glutinosa* and tobacco, and streak on sweet pea.

Inoculations of the spotted wilt virus into Perfection peas from infected tomato, tobacco, and romaine lettuce were successful, and confirmed Whipple's conclusions as to the identity of the pea streak and spotted wilt viruses [loc. cit.]. The virus was successfully transmitted by *Thrips tabaci* to sweet peas (from head lettuce) and to garden peas. Control of streak lies in the isolation of sweet pea plantings and in the protection of plants from migrations of infectious *Thrips*.

Gigante (R.). **Il mosaico della Violaciocca** [Stock mosaic].—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 166–174, 1 pl., 9 figs., 1936.

In 1931 and 1936 stocks (*Matthiola incana*) in the vicinity of Rome occasionally showed symptoms of a mosaic disease. Light green, later yellowish-green to dark yellow, irregularly distributed areas with a well-defined edge appeared on the leaves, which also developed protuberances and became very irregular and contorted; the older leaves turned brown and finally fell off. In some cases, the edges appeared as if slashed. The apical nodes were close together, resulting in a rosette formation of the leaves, and the stems and branches were thin and sometimes sharply bent or twisted. The roots were thin and not infrequently fasciated. Affected plants were dwarfed and the stem and branches withered from the apex downwards, this process unless arrested resulting in death. The flowers on affected plants either remained small and sickly or dried up, rendering the plants commercially worthless. X bodies 4·5 to 10·5 μ long were present in the cells of the palisade and spongy tissues of the diseased leaves.

The disease was successfully transmitted when cotton wool soaked in infected juice was rubbed on healthy leaves, or inserted in wounds in the stems, or when infected juice was injected into healthy branches. In these cases the primary symptoms appeared in the inoculated plants within two to three weeks. It was also transmitted by grafting a diseased branch on to a healthy plant, or vice-versa, but inoculations by means of aphids (*Macrosiphum* sp.) were unsuccessful.

Pape (H.) & Engelhardt (F.). **Pilzkrankheit an Treibwicken.** [A fungous disease of greenhouse Vetches.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 48, p. 578; 52, p. 627, 1936.

In reply to the query of a correspondent concerning a disease of greenhouse vetches, H. Pape attributes the pale grey spotting of the leaves, followed by complete defoliation, to infection by *Cladosporium* [or *Hyalodendron*] *album* (*Erostrotheca multiformis*) [*R.A.M.*, ix, p. 629; xiv, p. 69]. The disease is promoted by high atmospheric humidity and warmth and may be combated by repeated applications of sulphur dust.

F. Engelhardt draws attention to the liability of sulphur dust to burn the flowers (it can safely be used on younger plants), and advises the substitution of erysit [ibid., xv, p. 583] (75 c.c. per 10 l. water) for the later stages of the disease.

Gregor (Mary J. F.). **A disease of Cherry Laurel caused by Trochila laurocerasi (Desm.) Fr.**—*Ann. appl. Biol.*, xxiii, 4, pp. 700–704, 1 pl., 1936.

The author describes a leaf spot of cherry laurel (*Prunus lauro-*

cerasus) observed in 1932 in Dumfriesshire, the causal organism of which was identified as *Trochila laurocerasi* by Miss Wakefield, who stated that some years previously she had seen a similar case at Norwich. At first the spots are yellowish with very indefinite margins, but later become sharply delimited; larger spots may not infrequently consist of several more or less concentric rings, the colour of which sometimes markedly varies from greyish-brown to a deep red-brown. The fructifications of the fungus are mainly confined to the upper surface of the leaves; *Gloeosporium* acervuli are formed first and are succeeded by apothecia of *T. laurocerasi*. The affected leaf areas drop out, leaving circular to irregular holes, and Dr. Pethybridge is stated to have observed lesions on the green parts of the twigs as well.

Monoconidial or mono-ascospore cultures of the fungus were identical in every respect, and on pieces of sterilized cherry laurel leaves the *Gloeosporium* stage was quickly followed by apothecia, thus establishing the genetic connexion between the two stages. The conidial stage was identified as *G. phacidiellum* Grove, and agreed in every detail with the type specimen, the dimensions of the spores being 11·9 to 18·6 by 4·2 to 6·3 μ, compared with 12·3 to 17·9 by 3·9 to 7·4 μ for the type, though those given in the original diagnosis were 18 to 20 by 7 to 8 μ.

The results of numerous inoculation experiments during the spring and summer months showed that young cherry laurel leaves become infected most commonly through wounds, and that a moist atmosphere is essential for the development and spread of the disease. Attempts to infect leaves during late autumn or in their second year of growth consistently gave negative results. The control measures recommended consist of spraying the diseased bushes with colloidal sulphur during spring and early summer, and of cutting back the bushes only in the autumn, not at short intervals during the summer, as is frequently the practice.

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. III. Fusarium und Cylindrocarpon und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. III. *Fusarium* and *Cylindrocarpon*, and their relationship to fruit-rotting.]—*Z. PflKrankh.*, xlvi, 11, pp. 534–544, 1936.

Continuing their studies of imperfect fungi associated with fruit rots [*R.A.M.*, xvi, p. 191] the authors give details of their inoculation experiments on apples, pears, plums, and tomatoes with *Fusarium avenaceum* (and its form 1), *F. scirpi* var. *acuminatum*, *F. oxysporum* var. *aurantiacum*, *F. orthoceras* var. *longius*, *F. bulbigenum*, *F. equiseti*, *F. moniliforme* var. *minus*, *F. semitectum* [ibid., xv, p. 775], *Cylindrocarpon heteronemum*, *C. mali* [*Nectria galligena*: ibid., xv, p. 514], *C. mali* var. *flavum*, *C. album*, *C. candidum* var. *majus*, *C. curvatum* [ibid., xv, p. 605], and *C. radicicola* var. *violaceum*, all of which were isolated from various dessert and vegetable fruits. The results of the tests, which were carried out at room temperatures, showed that the organisms varied widely in their fruit-rotting capacities, and that none of them attacked plums. All the species of *Cylindrocarpon* were pathogenic to apples, pears, and tomatoes, while the last-named fruit was

rotted by all the species of *Fusarium* tested, and apples and pears by all except that no rotting was caused by *F. moniliforme* var. *minus* on pears, by *F. orthoceras* var. *longius* or *F. bulbigenum* on Ananas Pippin apple, by *F. oxysporum* var. *aurantiacum* on Roter Eiser apples, nor by *F. equiseti* and *F. semitectum* on either apples or pears. Apples were rotted by strains of *F. scirpi* var. *acuminatum* isolated from apples or tomatoes, but not by those isolated from *Buxus* sp. or maize.

RICHTER (H.). **Fruchtfäule durch den Erreger des Obstbaumkrebses (Nectria galligena Bres.).** [Fruit rot caused by the agent of fruit tree canker (*Nectria galligena* Bres.).]—*Angew. Bot.*, xviii, 6, pp. 477–481, 4 figs., 1936.

In August, 1936, the writer observed an attack of fruit rot by *Nectria galligena* [see preceding abstract] on apples on a tree of an undetermined variety in the Lüneburger Heide, Germany, the symptoms agreeing in the main with those described by Osterwalder from Switzerland [*R.A.M.*, xi, p. 247]. The tissues turned brown and sank from the calyx upwards and later bore sporodochia of the fungus. Most of the diseased fruits dropped prematurely, but those infected at an early stage were completely disintegrated and remained hanging on the tree in a mummified condition. The trees of other varieties surrounding the infected one remained unaffected.

JAMALAINEN (E. A.). **Boorin viakutus knoppataudin esiintymiseen Omenissa.** [The effect of boron on the occurrence of cork disease in Apples.]—*Valt. Maatalousk. Julk.*, 89, pp. 5–19, 2 figs., 1936. [English summary.]

Details are given of experiments in the control of cork disease or internal cork of apples in Finland [*R.A.M.*, xv, p. 446; xvi, p. 261]. In June, 1935, each of four trees was supplied with 20 gm. boric acid incorporated in the soil round the trunk within the radius of the leaf crown. One of these trees, the whole crop of which was affected in the previous year, bore only 15 per cent. of corky fruits. In further experiments in 1936, boric acid was similarly applied to the soil round four trees at the rates of 200 and 500 gm., while three other trees received injections of the compound at concentrations of 3, 5, and 10 gm. Not a trace of cork disease was detected in the trees to which the soil treatments were applied or in that receiving an injection of 5 gm. boric acid; there were 9·9 per cent. affected apples on the tree given 3 gm. and 18·6 per cent. on that receiving 10 gm., though none of the fruits on the injected branch itself was corky. No injury followed any of the soil treatments or the 3 and 5 gm. injections, but the maximum quantity of 10 gm. induced foliar injury. In other tests in different localities the application of 100 or 200 gm. boric acid to the soil at the base of the trunks gave almost complete control of cork disease without damaging the trees. As a result of these investigations the writer proposes to adopt the soil treatment with 100 to 200 gm. boric acid (equivalent to 200 to 400 gm. borax) in future operations against the cork disease, to be applied preferably immediately after blossoming.

Attention is drawn to certain important analogies between internal cork of apple and other boron deficiency disturbances, e.g., brown heart

of swedes [ibid., xvi, p. 225], including the predominant involvement of the meristematic cells or succulent portions of the plant and the low sugar content of the diseased tissues.

HILL (H.) & DAVIS (M. B.). **Physiological disorders of Apples.**—*Sci. Agric.*, xvii, 4, pp. 199–208, 4 pl., 1936. [French summary.]

An account is given of the authors' observations and investigations during five years of the disorders of apples in the provinces of Quebec and Ontario known as cork or internal cork [see preceding abstract], corky core [*R.A.M.*, xvi, p. 260], and tree pit or bitter pit [ibid., xv, p. 812]. As a result of their work, the authors are led to believe that cork and corky core are but two varietal expressions of the same disorder. No correlation could be established between the occurrence of these troubles, either in pots or in the field, and the amount of root injury, but internal cork was experimentally produced by waterlogging or subjecting to drought conditions trees in pots which previously had only produced healthy fruit. A marked correlation was observed between the incidence of the disorders in pot-grown trees and prolonged heavy applications of nitrogen, irrespective of other conditions. In general, these diseases have been found to be associated with soils with a high carbonate lime content, high percentages of nitrogen and organic matter, especially in association with shallow-rooted trees where the subsoils are compact, soil moisture excess or deficiency together with high percentage of nitrogen and organic matter, and low available potash and a high phosphorus-potassium ratio, especially in the lower soil horizons. Boron used in solution with trees in pots or injected into trees in the solid form in the orchard effected control of internal cork, corky core, and drought spot. At high P_H values of the soil due to overliming, or to a natural high lime or magnesia content, boron may be relatively unavailable.

TURNBULL (J.). **Commercial fruit-spraying demonstration in West Norfolk.**—*J. Minist. Agric.*, xliii, 9, pp. 846–854, 1936.

The author gives a detailed account of a successful attempt to demonstrate in a 10-acre plantation of badly cropping Bramley and Emneth apple trees how thoroughness in spraying can be achieved easily and rapidly with very beneficial effects on the crop, by using high pressure and short lances with double nozzles, as designed and described by him [*R.A.M.*, xiv, pp. 114, 369]. It is stated that the sizes of disks have now been standardized, and are measured in sixty-fourths of an inch.

SHIMA (Y.). **Studies on the young fruit-rot of Apple-tree.**—*J. Fac. Agric. Hokkaido Univ.*, xxxix, 3, pp. 143–270, 9 pl., 1936.

An exhaustive, fully tabulated account is given of the writer's studies during the period 1924 to 1932 at the Aomori Agricultural Experiment Station and at Hokkaido on the destructive blossom blight and rot of young apple fruits caused by *Sclerotinia mali* Takah., of which *S. malicola* M. Miura is considered to be a synonym, while *Phaeosclerotinia nipponica* Hori [*Lambertella corni-maris*: *R.A.M.*, xv, p. 531] may be differentiated by its brown conidia and ascospores.

The disease may be divided into four phases, namely, leaf and blossom blights, young fruit rot, and axis blight. Leaf blight appears on young leaves of the fruit spurs when the flower buds are in the pink stage as a reddish-brown lesion which extends to the petiole and axis of the flower cluster. Usually only one or two leaves of a rosette are infected. Blossom blight normally develops 3 or 4 days after the leaf blight, and is caused by the fungus invading the axis and other petioles or pedicels, causing the whole cluster to wilt. The disease appears before the blossoms are open, and on affected clusters dark grey or greyish-white pustules [cf. ibid., xvi, p. 190] are found in abundance. Young fruit rot is first manifested as a brown fleck about half way down the fruit with a light brown exudation from the lesion. The exuded juice flows down the stalk and dries up, causing a dirty yellowish-brown staining. The area of the lesion remains as a greyish-brown depression on one side of the fruit, which becomes lop-sided. Most of the affected fruits fall, but some may be left hanging till the following spring. Pustules are borne in wet weather. Axis blight is caused by invasion from the affected young fruits, but the girdling of the axis is slow enough to allow the fungus to infect other fruits of the cluster. When the axis is girdled the cluster dries up and hardens. Greyish-white pustules are formed, and the production of conidia is sometimes observed.

The leaf blight symptoms occur in late April to early May. Both macro- and micro-conidia are produced on the leaves or stem in 4 or 5 days, and the macroconidia are carried by the wind or insects to the blossoms on opening. Young fruit rot occurs about ten days after anthesis, and subsequently axis blight. Sclerotia are formed in the young fruits and stem, and the fallen sclerotia form apothecia in late April or early May, just in time to cause the leaf blight symptoms.

The leaf and blossom blights were shown by inoculation experiments on the Jonathan, A. S. Pearmain, and Ralls varieties to be caused by the ascospores of the fungus, while the fruit rot and its natural extension, axis blight, are usually the result of conidial infection of the stigmas, though ascospores are also capable of stigma infection. Only the very young leaves were susceptible to infection either with ascospores or conidia. None of the 25 varieties tested in 1927 and 1928 proved to be resistant to fruit rot, while only 6 out of 113 remained free from infection in a serious epidemic in 1931, and these formed too few blossoms to yield significant data. Positive results were given by inoculation of the stigmas of Flemish Beauty pears, Japanese pear (*Pyrus serotina*), quinces, and medlars (*Mespilus germanica*), whereas cherries and plums (*Prunus salicina*) reacted negatively to the fungus.

The hyphae arising from the ascospores on the surface of the stigma enter the style between the papillate cells of the stigma, proceed straight down the conducting tissue without branching, and invade the seed cavity through the sutures of the carpel margins, whence they migrate downwards along the epidermal surface of the carpel or the placenta towards the funicle and ultimately reach the nucellus through the micropyle. The presence in the withered ovules of deeply stained hyphae indicates that infection through the stigmas is the primary cause of the abscission phenomena in young fruits. Hyphal growth is influenced by temperature, the embryo sac being invaded 48 hours

after inoculation during a warm spell in the blossoming period of 1930, while in the cooler weather of 1931 the time required for infection was 120 hours.

The macroconidia are shortly ellipsoidal to lemon-shaped, obtusely papillate, hyaline, 11·7 to 7 by 9·4 to 4·7 μ in diameter with typical disjunctors. The formation of conidia on diseased organs of the previous year has not yet been observed in nature or induced in culture. [No description is given of the apothecia or microconidia.]

Control of the leaf and blossom blight phases of the *Sclerotinia* disease should be based on the collection and destruction, by burning or burying, of diseased leaves, petioles, stalks, and fruits, all of which harbour the sclerotia of the fungus, and by the application of lime-sulphur (Beaumé 4·5° to 5·0°) at the dormant or green tip stage followed by lime-sulphur or Sapporo mixture (0·8 per cent. Bordeaux mixture plus sodium arsenite) at the delayed dormant stage, and Sapporo mixture at pink and petal fall stages, the last two applications being of lesser importance. Spraying is ineffectual against the fruit rot and axis blight, but their incidence may be minimized by the adoption of cultural methods conducive to the prevention of fruit abscission; the bearing of nutritional factors on this phenomenon is discussed at some length.

PIEHL (A. E.) & HILDEBRAND (E. M.). **Growth relations and stages in the life history of Fabraea maculata in pure culture.**—*Amer. J. Bot.*, xxiii, 10, pp. 663–668, 22 figs., 1936.

In a cultural study [which is fully described] of the quince and pear leaf blight and fruit spot organism (*Fabraea maculata*) [*R.A.M.*, xv, p. 260] the best medium for the development of the conidial stage (*Entomosporium maculatum*) was potato dextrose agar, on which the colonies were white, round, smooth, later fimbriate, changing to yellow and finally to reddish-brown. Numerous conidia were liberated and readily scattered, starting new growths surrounding the old colonies. These individual colonies show a concave centre which becomes darkened, or yellowish and shiny when conidia are found in abundance. The best growth was obtained at 18° and 21° C., and the optimum hydrogen ion concentration was between P_H 6·8 and 7·4.

The perfect stage of the fungus developed in pure culture isolated originally from conidia. A 5 per cent. sucrose solution was poured into Petri dishes and healthy green quince leaves floated in it. After sterilization pieces of pure conidial cultures were placed on the leaves and left to incubate at room temperature. As the water in the sugar solution evaporated the white mycelial mass turned black and became much smaller, and showed the presence in groups, arising from a stroma, of asci with bicellular ascospores typical of *F. maculata*. Ascogonial coils were found in the mycelium surrounding the ascogenous material. The presence of these coils and of what appeared to be spores simulating spermatia in some of the cultures suggests that they may be elements in a sexual mechanism. Attempts to culture the fungus from individual ascospores were unsuccessful. The closed fruit body is an early stage of development, for the mature asci formed in culture were situated on a stroma free from any kind of covering. As the asci

are produced the contents of the ascocarp swell and cause the closed fruiting body to spread open into a typical apothecium (resembling the type found in the Phacidiales), as described by Atkinson (*Science*, xxx, p. 452, 1909).

WILSON (E. E.). **Symptomatic and etiologic relations of the canker and the blossom blast of Pyrus and the bacterial canker of Prunus.**—*Hilgardia*, x, 8, pp. 213–240, 6 figs., 1936.

A comparative study of pear bacterial canker in California [*R.A.M.*, xiii, p. 641] and stone fruit canker due to *Phytomonas* [*Pseudomonas*] *cerasi* [ibid., xiii, p. 451] showed that in the former considerable loss is sometimes caused by infection of the small branches and twigs. In both diseases, infection takes place through dormant buds and leads to the death of twigs and small branches. The infection of the fruit cluster bases in the pear disease has no counterpart in the stone fruit disease; furthermore, no bacterial exudate occurs in the blossom blast phase of the pear disease, and no symptoms are produced on the leaves. Generally speaking, however, the pear and stone fruit diseases showed marked similarities in the parts attacked, in appearance of the invaded tissue, and in seasonal distribution.

In comparative inoculation tests on Japanese plum (*Prunus salicina* and *P. munsonia* hybrid), European plum, apricot, peach, sweet cherry, and pear, the California pear organism (from limb cankers and from blossoms) were pathogenic to all, and *Phytomonas* [*Pseudomonas*] *citriputeale* [ibid., xv, p. 575], *Phytomonas* [*Pseudomonas*] *utiformica* [ibid., xiv, p. 16, and above, p. 302], the pear blast organism isolated by H. R. Rosen in Arkansas [ibid., xvi, p. 157], *P. cerasi*, and *P. cerasi* var. *prunicola* were pathogenically similar to it. A Californian culture from limb canker of apple (No. I) was pathogenic to Japanese plum and apricot, but gave doubtful results on European plum, peach, and sweet cherry, while another strain (No. II) from the same host gave doubtful results on Japanese plum, the only host tested. *Phytomonas* [*Pseudomonas*] *papulans* [ibid., xiv, p. 319] produced no symptoms on any of the stone fruits. Evidence obtained in orchards indicated that spread of bacteria takes place from stone fruit trees to pears.

Cultural tests showed that the Californian pear cultures consistently differed among themselves in that three cultures from limb canker of Wilder pear produced fluorescence on potato dextrose agar, whereas cultures isolated from twigs and blossoms did not, a characteristic similar to that separating *P. cerasi* from *P. cerasi* var. *prunicola*. The parallel fluorescigenic variability on potato dextrose agar, and similar reactions in all other tests, of the stone fruit and Californian pear cultures gave no indication that they were very different from one another. The apple culture I was very similar to the pear cultures, whereas culture II was clearly distinct from the latter. *P. papulans* was unlike any of the other organisms studied. *P. citriputeale*, *P. utiformica*, and the pear blast cultures from Arkansas agreed culturally with *P. cerasi* var. *prunicola* and with those Californian pear cultures that were not fluorescent on potato dextrose agar. Both in the pathogenic and cultural tests the only clear differences were those of *P. papulans* and apple strain II, though the rest of the cultures showed

certain minor cultural differences. Host source did not appear to be an important line of cleavage.

It is concluded that the limb canker and blossom blast of pear are phases of the same disease, the organism causing which, together with *P. cerasi*, *P. cerasi* var. *prunicola*, *P. citriputeale*, *P. utiformica*, Rosen's organism, and the stone fruit organism should be included in one species, the correct name for which would appear to be *P. syringae*. The bacterium designated *P. papulans* is an unrelated species.

BAINES (R. C.). **The status of Peach virus diseases in Indiana.**—*Hoosier Hort.*, xviii, 12, pp. 180–182, 1936.

In October, 1936, a peach tree infected by the phony disease [*R.A.M.*, xvi, p. 192] was detected in Posey County, Indiana, and during the previous summer a number of plum trees in the State were observed to be suffering from mosaic, which is liable to spread from this host to the peach [loc. cit.]. In this connexion notes are also given on yellows, little peach [ibid., xvi, pp. 109, 157], red suture, and rosette of peaches [ibid., xvi, p. 109], none of which is widespread in Indiana at the moment, probably owing largely to the high summer temperatures prevailing in the State, coupled with the virtual absence of insect vectors. Planting stock should be secured exclusively from reliable sources and a careful watch kept for the first signs of any of the abovementioned diseases.

KUNKEL (L. O.). **Peach mosaic not cured by heat treatments.**—*Amer. J. Bot.*, xxiii, 10, pp. 683–686, 1 pl., 1936.

The symptoms of the Colorado peach mosaic [see preceding abstract] used in these studies are described in some detail from material grown in the greenhouse. The earliest sign of infection is a slight bending in the main stem of rapidly growing trees a little below the growing point. Shortly after, small, chlorotic spots appear in one or more leaves near fast growing tips, usually on one side of the midrib in the lowest part of the lowest affected leaf. In the leaf above they generally develop on both halves. As the chlorotic spots enlarge they may fuse, the leaves later showing a shot-hole effect. The diseased trees may produce apparently normal leaves during the rest of the season, or they may produce narrow, malformed, deep green leaves. Affected trees bearing apparently healthy leaves are stunted. When growth is resumed, mottling accompanied by leaf stunting and malformation usually develops at the tips of main stems and branches.

All attempts to transmit the disease by juice inoculations gave negative results, but transmission was readily effected by budding.

Heat treatments at 34·4° to 36·3° C. sufficiently prolonged to cure peach yellows, rosette, little peach, or red suture [ibid., xvi, pp. 109, 157] had no effect on the condition, and the virus was not inactivated in bud sticks held at 35°, 42°, or 50° for periods approaching the limit of endurance of peach tissue. Peach mosaic, therefore, is apparently not closely related to yellows, rosette, little peach, or red suture.

Güll (A.). **Die Narren- oder Taschenkrankheit der Zwetschen.** [The crazy or pocket disease of Plums.]—*Obst- u. Gemüseb.*, lxxxii, 12, p. 190, 1936.

A popular note is given on the pocket plum disease caused by *Taphrina pruni* [*R.A.M.*, xiii, p. 706], which is stated to have been widespread in Germany in 1936 as a sequel to particularly favourable spring weather conditions. All diseased material should be promptly excised and destroyed.

Thomas (H. E.) & Hildebrand (E. M.). **A virus disease of Prune.**—*Phytopathology*, xxvi, 12, pp. 1145–1148, 1 fig., 1936.

Since 1930 Fellenberg prune trees in Niagara County, New York, have been sporadically infected by a virus disease causing stunting, excessive narrowness, mottling, and rugosity of the leaves, the last-named feature being more conspicuous near the midrib than towards the margins, which are frequently so irregular in outline as to suggest insect infestation. The leaf surfaces present a somewhat glazed appearance. All the leaves on a given shoot are more or less affected, especially near the base, and the internodes shortened. An unusual feature of the disease is the development of an occasional apparently normal shoot in the midst of severely affected buds. In many of the blossoms the pistils are abortive and the petals narrow and irregular. The fruits of diseased trees seldom reach maturity. The disorder was successfully transmitted by grafting to a limited number of prune and plum trees, but not to cherry or peach, while negative results were given by experiments in its conveyance by means of aphids. It seems improbable that the disease under observation is identical with the plum and peach virus reported from Kentucky [*R.A.M.*, xii, p. 454] (and also observed on Santa Rosa plums in California), with any of Atanasoff's group of mosaics of drupaceous fruits [ibid., xiv, p. 642], or with certain allied disturbances of plum and peach now under investigation by D. Cation in Michigan, and though similar symptoms have been reported for prunes in Holland [ibid., x, p. 252] these are said to occur there also on cherry and peach.

Artemieff (G. V.). Грибные болезни **Feijoa sellowiana Berg.** [Fungal diseases of *Feijoa sellowiana* Berg.]—*Pl. Prot. Leningr.*, *1936*, 8, pp. 138–142, 1936. [English summary.]

This is a slightly expanded version of the author's recently noticed communication on the fungal diseases of *Feijoa sellowiana* in the Caucasus [*R.A.M.*, xv, p. 593], giving, in addition to the information already reviewed, the Latin diagnoses of the species described by him as new to science, and a list of the fungi recorded on this host by previous workers.

Héranger (S. F.). **La persistance des liquides et le mouillage des végétaux.** [The persistence of liquids and wetting of plants.]—*Rev. Vitic., Paris*, lxxxv, 2215, pp. 449–453; 2216, pp. 472–477; 2217, pp. 491–498, 1 fig., 2 diags., 2 graphs, 1936.

The results of further studies on the 'wettability' of spray liquids [*R.A.M.*, xiv, p. 556] showed that when a liquid is allowed to flow

slowly along an inclined rod [the substance of which is not indicated] it first spreads for a definite distance in a uniform thin sheath, and then begins to gather into separate drops, which follow each other at more or less regular intervals. The first phase, termed 'persistence', is constant for a given liquid at the same temperature, and may be readily determined by means of a simple apparatus (persistometer), which is briefly described. On rods of sufficient length the phenomenon of persistence is repeated several times, in that after gathering into drops the liquid spreads out again and then gathers up into drops once more, and so on. The writer shows that the length of the persistence phase is directly related to the spreading capacity of a spraying liquid, which can thus be determined by a simple and rapid test. The term 'mouillance' is now re-defined as the length of the film formed by the liquid tested (owing to its persistence) on a rod, after plunging it vertically into the liquid; it is measured in lengths of centimetres, each of which is considered to be a unit of 'mouillance'. A simple apparatus, termed a 'standardized mouillometer', based on this principle, enables one to read off on a graduated scale the length of the liquid film adhering to the rod. With its help the 'mouillance' of Paris tap water was determined as ten units, and that of alkaline 2 per cent. Bordeaux mixture and of alkaline 2 per cent. Burgundy mixture as 8·5 units. Used to test the effect of various spreaders on water and the two spray mixtures, it showed that the effect of a given substance varies with the nature, concentration, and temperature of the liquids; of the substances tried, terpenic alcohol [ibid., xv, p. 736] was more effective (17 mouillances) in Bordeaux mixture than fat sulphonated alcohol (16 mouillances), and both substances were of equal efficacy (17·5 mouillances) in Burgundy mixture. Ox bile imparted a mouillance of 15 to the Bordeaux and of 16·5 to the Burgundy mixture. The work indicated that there is a limit for any of the spreaders that were tested, beyond which their effect on the spreading quality of the sprays was the reverse of that desired. The practical advantages of the apparatus (which is patented) are briefly discussed.

MARSH (R. W.). **Notes on a technique for the laboratory evaluation of protective fungicides.**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 304–309, 1 fig., 1936.

Parallel tests are described on leaves and slides for the laboratory evaluation of protective fungicides. Microscope slides were dipped into a solution of nitro-cellulose in butyl acetate, drained, and dried, the film being sealed at the edges when required for leaching tests. The slides were then sprayed with the fungicide following a standardized method involving the use of the atomizing apparatus devised by Evans and Martin [*R.A.M.*, xv, p. 382] which was adjusted to give an even deposit of droplets at the rate of 0·05 c.c. of spray fluid per sq. in. The slides were then dried, and three drops (each 0·015 c.c.) of a suspension of conidia of *Venturia inaequalis*, taken from the youngest natural infections on Crimson Cox apple leaves, were placed in line on the sprayed side of the slide, each drop containing 200 to 300 conidia. The inoculated slide was then inverted and enclosed over water in a Petri dish, spore germination counts being made after 24 and 48 hours.

For the leaf tests a single Crimson Cox apple leaf about $1\frac{1}{2}$ in. long was selected near the tip of a shoot and allowed to remain attached to the stem, all the others being removed. The leaf was then sprayed on the upper surface in the same manner as the slides, and allowed to dry. For leaching tests the leaf supported horizontally was sprayed with distilled water at the rate of 12 l. per hour from a fine rose, fixed 1 ft. above the leaf surface, for an hour, and again allowed to dry. Two drops of inoculum, each of 0·015 c.c., were placed on either side of the midrib on the upper surface, and the inoculated leaf was at once covered by a glass bulb open at the lower end which fitted within the top of the tube holding the shoot and was sealed by the water. Germination of the spores was determined on excised portions of the leaf after 24 and 48 hours.

Using this technique, the author found that spray deposits from cuprous cyanide, cupric ferrocyanide, and lime-sulphur were less fungicidal on leaves than on the slide.

ROBERTS (J. W.). **Recent developments in fungicides: spray materials.** —*Bot. Rev.*, ii, 12, pp. 586–600, 1936.

A review is given of recent developments in the improvement of the older standard fungicides and the evolution of new ones, with special reference to fruit disease control in the United States. The preparations are divided into three groups, those with a basis of (1) sulphur, (2) copper, and (3) other essential ingredients, while spreaders and stickers are briefly discussed in the concluding section. Most of the papers cited in the bibliography of 102 titles have been noticed in this *Review*.

MCBRYDE (MARY C.). **A method of demonstrating rust hyphae and haustoria in unsectioned leaf tissue.**—*Amer. J. Bot.*, xxiii, pp. 686–688, 2 pl., 1936.

A new method of staining rust infected leaf material *in toto* is described. It consists in clearing the tissue in a saturated solution of chloral hydrate, staining in a 2 per cent. solution of acid fuchsin in 70 per cent. alcohol diluted with a saturated solution of chloral hydrate and 95 per cent. alcohol, destaining in a saturated solution of chloral hydrate, dehydrating in 85, 95, and 100 per cent. alcohol, counter-staining for 5 minutes in a strong solution of picric acid in oil of wintergreen, clearing (5 minutes) in oil of wintergreen, and mounting in balsam.

WATSON (MARION A.). **Factors affecting the amount of infection obtained by aphis transmission of the virus Hy. III.**—*Philos. Trans. roy. Soc.*, Ser. B., ccxxvi, 540, pp. 458–489, 9 graphs, 1936.

Preliminary tests made to ascertain the effect of various factors on the percentage infection obtained with the virus Hy. III [*R.A.M.*, xiv, p. 51], using the insect vector *Myzus persicae*, showed that tobacco was slightly more susceptible than *Hyoscyamus* [*niger*], the percentages of infection being 52·00 and 43·56, respectively, and the remainder

of the experiments were therefore carried out with tobacco. There was no apparent difference in efficiency between the two hosts as sources of infection. A comparison between tobacco leaves of different ages showed that the first two leaves of a young plant, though the most satisfactory for aphid feeding, were not the most efficient sources of inoculum, and the third leaf was chosen whenever possible. Owing to differences in susceptibility between leaves of different ages on the same plant, the aphids were fed on the first true leaf or a random selection of first and second.

In weekly inoculations over 14 months, maximum percentage infection was obtained during winter (October to mid-January), and a minimum during summer, whatever the number of insects used per plant. The annual range of infection for 1 aphid was between 5 and 40 per cent.; for 5, 20 to 80 per cent.; for 10, 40 to 95 per cent., and for 20, 75 to 100 per cent.

The percentage of infection increased with the number of aphids used per plant, 1, 5, 10, and 20 aphids per plant giving, respectively, out of 240 plants inoculated in each test 28, 127, 163, and 190 infected plants. Evidence is adduced indicating that each infection is local and independent, and not due to the cumulative effect of individually inadequate doses. Low percentage infections obtained with single insects for many viruses do not necessarily indicate low efficiency in the vectors, but are frequently due to fluctuations in infective capacity occasioned by the experimental conditions.

When 1 to 20 aphids fed for 12 hours on infected leaves were allowed to feed for varying periods on healthy seedlings the percentage infection increased with increase in the feeding period. The percentage infection produced on 114 plants by 1 aphid fed on them for 3 to 48 hours ranged from 6·6 to 27·8 per cent., respectively, the corresponding range for 20 aphids being 81·8 (on 72 plants) to 89·3 per cent. (on 69 plants). There appeared to be no distinct time interval preceding possible infection that could be regarded as an incubation period.

For 95 per cent. of the aphids the time occupied in settling down to feed ('penetration time') was under 10 minutes, the average time required for 560 aphids being 4·88 minutes. Penetration time was longer on some days than others, variation being negatively correlated with relative humidity in the insectary at feeding time.

Preliminary experiments made to ascertain the effects of variation in feeding periods on infected plants gave a somewhat unexpected result, the percentage infection of healthy plants decreasing with increased feeding periods on the infected plants; a very much higher number of infections was obtained after 3 and 5 minutes' than after 12 hours' feeding. More comprehensive experiments arranged on a factorial design confirmed this result, the highest percentage infection, 60 per cent., being reached after 2 minutes on the diseased plants, the figure falling rapidly to 11 per cent. for 1 hour, and then rising very slowly to 21 per cent. for 12 hours.

The aphids were ascertained to be capable of infecting more than one plant consecutively without intermediate access to any source of infection, but the number of second infections decreases rapidly with increasing time on the healthy plant and is negligible after one hour.

GORDON (H. D.). **Mycorrhiza in Rhododendrons.**—*Rep. Brit. Ass., 1936*, pp. 424–425, 1936.

Rhododendron roots in nature are stated regularly to harbour an endophytic fungus of the type encountered in *Calluna*, *Vaccinium*, and the majority of the Ericaceae [*R.A.M.*, xv, p. 308]. Infection appears to be confined to the roots and has not been observed in the stem, leaf, fruit, or seed. The endophyte is not seed-borne, seedling infection normally taking place through the soil several weeks after germination. Seeds have been germinated, and the resultant seedlings grown in pure culture without the endophyte or any other micro-organisms. The fact that such seedlings are capable of normal growth and the production of a copious root system is considered to prove that there is no obligate relation between the higher plant and the endophyte.

ISAKOVA (Mme A. A.). **On the problem of the nature of the action of bacteriorhizal microorganisms on plants.**—*C.R. Acad. Sci. U.R.S.S.*, N.S. iv, 9, pp. 429–432, 1936.

A tabulated account is given of experiments in which the action was studied of bacterial suspensions obtained from bacteriorhiza [*R.A.M.*, xv, p. 520] of cotton, wheat, tobacco, beans [*Phaseolus vulgaris*], and from a soil mixture, on the germination of cotton, Indian tobacco, and wheat seeds. When seeds of cotton and tobacco were sprinkled with the suspensions, the germination of cotton was most accelerated by the cotton bacteriorhiza which, on the third day from sowing, increased the number of seedlings by 56 per cent., the bacteriorhiza from a soil mixture coming next (52 per cent. increase); whereas the germination of tobacco was most stimulated by the wheat bacteriorhiza which gave an increase of 29 per cent. in the number of seedlings on the sixth day. The inoculations also caused an increased vigour in the seedlings. In wheat seed-grain steeped and allowed to swell in a suspension of the various organisms the greatest effect was that of the bacteriorhiza from the soil mixture, which gave an increase in the number of sprouted seeds of 28 per cent., while the wheat bacteriorhiza only gave 18 per cent., and the bean bacteriorhiza 12 per cent.

The specificity of the action of the various bacteriorhizal complexes was confirmed on other material, and is stated to be in full conformity with previous work by the author, which showed the strict individuality of the different groups of plants with respect to biochemical processes that occur in their rhizospheres. The experiments are considered to indicate that the action of the micro-organisms is a phenomenon of the hormonal type and not a modification of the nutritional regime.

KUPREWICZ (V. F.). К физиологии больного растения. (Физиологические данные о вредоносности некоторых грибных и вирусных болезней культивируемых растений.) [Contribution to the physiology of the diseased plant. (Physiological data on the injuriousness of certain fungal and virus diseases of cultivated plants.)]—*Acta Inst. bot. Acad. Sci. U.R.S.S.*, Ser. iv, (*Bot. exper.*), *1936*, 2, pp. 283–345, 1 fig., 10 graphs, 1936. [English summary.]

This is a reprint of the author's thesis [which has already been

noticed: *R.A.M.*, xiv, p. 52] on the effect of disease on the physiological processes in plants.

DIMOCK (A. W.). **Variation in a species of Fusarium induced by high concentrations of zinc salts.**—*Zbl. Bakt.*, Abt. 2, xcv, 13–17, pp. 341–347, 2 figs., 1 diag., 1936.

During an intensive two-year study at California University of a monospore strain of a *Fusarium* from gladiolus, tentatively identified as *F. oxysporum* var. *gladioli* [*R.A.M.*, xi, p. 356], sectoring occurred exclusively on standard nutrient media containing high concentrations of zinc chloride (7·5 gm. per l.), sulphate, or nitrate (4·5 gm.). Both the parent and the four aberrant strains were shown by monospore culture studies to be pure and homocaryotic. A single isolated spore of one of the mutants gave rise to a further variant, apparently as a sequel to aberrant mitosis or to 'spontaneous' gene mutation taking place during or shortly before spore formation. The mechanism of action of the zinc ion is interpreted either as an alteration of the self-perpetuating, extra-nuclear inclusions of the cytoplasm of the parent cells, or as a modification of the genic constitution of the nucleus [cf. ibid., xiv, p. 711].

STEVENS (N. E.). **A note on the temperature relations of certain fungi.**—*Mycologia*, xxviii, 6, pp. 510–513, 1 graph, 1936.

Advantage was taken of an unusually accurate series of temperature chambers to study the temperature relations and, in particular, the relative growth in culture of species of *Diplodia* common on maize and of a number of apparently closely related fungi. The organisms tested were *D. zeae* [*R.A.M.*, xvi, p. 246], *D. macrospora* [loc. cit.], *Physalospora obtusa*, *D. megalospora*, *Botryosphaeria ribis* [see above, p. 302], *B. melanops* [ibid., xvi, p. 136], *P. mutila* [ibid., xv, p. 726], *P. glandicola*, *D. natalensis* [ibid., xvi, p. 219], and *D. sarmentorum* [ibid., xv, p. 726].

A comparison of the temperature relations of these fungi with their geographical distribution showed that the maize fungi have a relatively narrow temperature range, making no growth at 10° or 35° C.

Within the 'Melanops' group (*Botryosphaeria* and *Physalospora*) the only species showing any considerable growth at 35° were *B. ribis* and *D. natalensis*, both of which are widely distributed in the tropics. Species abundant in north temperate regions, i.e., *P. glandicola*, *P. obtusa*, *P. mutila*, *D. sarmentorum*, *D. megalospora*, and *B. ribis* all showed good growth at 10°, with optima about 25° or 30°. The widest temperature range was shown by *B. ribis*, which also has the greatest known north and south distribution.

Included in the study were three 'pairs' of species of similar appearance but with one fungus in each pair having much larger pycnospores than the other, i.e., *D. zeae* and *D. macrospora*, *P. obtusa* and *D. megalospora*, and *B. ribis* and *B. melanops*. It was noted that the temperature ranges of the two members of each pair were similar, but the growth rate of the large-spored organism was much slower than that of the other on all media; also, the larger-spored forms were apparently much less common and less widely distributed in nature than the others.

VERONA (O.). **Sul comportamento dei microorganismi di fronte ad alcune sostanze coloranti, con particolare riferimento al verde malachite ed alla possibiltà di una sua applicazione fitoterapica.** [On the behaviour of micro-organisms towards certain colouring agents, with special reference to malachite green and the possibility of its application in phytotherapy.]—*Boll. Ist. agr., Pisa,* xi, pp. 421–472, 2 figs., 2 graphs, 1935. [Received February, 1937.]

This is an expanded version in Italian of a paper already noticed from another source [*R.A.M.*, xv, p. 244].

WARTENBERG (H.) & HEY (A.). **Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. IV. Mitteilung. Das Redoxpotential der Gewebebreiaufschlämmung der Kartoffelknolle als Kennziffer des Abbaues.** [The electrometric determination of the seed value of the Potato tuber. Note IV. The reduction-oxidation potential of the pulped tissues of the Potato tuber as the coefficient of degeneration.]—*Phytopath. Z.*, ix, 6, pp. 531–569, 11 figs., 5 graphs, 1936.

Continuing their investigations on the electrometric method of determining the health (from the standpoint of degeneration diseases) of potato seed-tubers [*R.A.M.*, xvi, p. 270], the authors give a detailed account of experiments, in which they halved the tubers of a large number of varieties of different origin, one half being immediately reduced to a pulp for the purpose of determining its reduction-oxidation potential, while the other was preserved for planting in the greenhouse or in the field. The results of the tests, which have been carried out for several years, showed from the first that only tubers in the winter resting stage may be usefully employed for the determinations, since only in the pulp from such tubers does an indifferent metal electrode assume a constant potential with the same properties as the balanced potential of a reversible system. It was found that the constant potential values may be different from tuber to tuber, and these differences are not due to differences in acidity, but may be explained by unequal reduction-oxidation relationships. It was further shown that the pulp prepared from tubers affected with degeneration always gave more negative potential values than the pulp of healthy tubers of the same variety and origin, the frequency curves of the reduction potential values being constant for each variety from the same locality. The curves for healthy and diseased tubers overlap for a certain region, which is termed the 'critical zone', since the potential values included within this zone cannot serve as a safe indicator of the health or otherwise of the corresponding tubers. The closer the potential value determined stands to the middle point of this zone the less reliable it is, and the middle point is termed the 'limit value', from the standpoint of health determination. The method discussed, therefore, requires the preliminary determination for each potato variety and origin of three potential ranges, namely, the range for the healthy tubers, the critical zone, and the range for the degenerated tubers.

A separate table shows the striking concordance there was between the results obtained by the electrometric method in the laboratory,

and the health condition of the preserved tuber halves which were sown in the field. A statistical estimation of the proportion of diseased tubers among the tubers with potentials falling in the critical zone gave an average of 36·90 per cent. diseased, the actual average obtained in the field from the corresponding halves being 34·90 per cent. diseased, with a correlation coefficient of $r = +0{\cdot}901$, demonstrating the validity of the calculation.

HORNIG (G.). **Vergleichende Untersuchung verschiedener Methoden zur Bestimmung des Abbaugrades bei Pflanzkartoffeln.** [Comparative study of various methods for the determination of the degree of degeneration in Potato seed-tubers.]—*Pflanzenbau*, xiii, 6, pp. 209–234, 1936.

A brief, tabulated account is given of the author's comparative tests of some of the different methods which have recently been suggested for the determination of the degree of infection of potato seed-tubers with degeneration [virus] diseases, the experiments being made with healthy and diseased tubers of the Sickingen and Erdgold varieties from various localities. Only a low degree of correlation could be established between a high content of starch in the mother-tuber and high yield, or vice versa. Seed-tubers with a high content in dry substance for the most part gave better yields than those with a lower content, and content in nitrogen appeared to be inversely proportional to the yield. The contents of potash, phosphoric acid, lime, sulphuric acid, and chlorine in the ash showed no definite relation to health, but healthy tubers showed a higher osmotic pressure in the autumn than diseased. The copper test [*R.A.M.*, xv, p. 821] gave useful indications in 60 per cent. of the trials with the Sickingen variety, but constantly failed with Erdgold. Neither quartz lamp analysis of disks cut from tubers nor P_H values showed any difference between healthy and diseased material. Wartenberg's and Hey's electrometric method [see preceding abstract] gave useful results with strongly differentiated material of the 'Zwickauer Early Yellow' and 'Erdgold' varieties, but not with Sickingen. The healthy tuber juice of the last-named variety assumed in a phenol solution a darker discoloration than that of virus-diseased tubers, but no difference in degree of discoloration could be observed between the juice of healthy and diseased tubers of the Sickingen variety.

MURPHY (P. A.). **Nature and control of Potato virus diseases.**—*Nature, Lond.*, cxxxviii, 3501, p. 955, 1936.

In this review of a discussion at the British Association on 'Scientific aspects of potato growing', the writer states that the simple, yellow, and veinal mosaic diseases, due to viruses X, F, and A, respectively, are normally passed over in the field, whereas veinal mosaic or leaf drop streak (Y), interveinal mosaic (X+F), crinkle (X+A), rugose mosaic or leaf drop streak (X+Y) make up the mosaic of the practical man [*R.A.M.*, xvi, p. 117]. The latter group are caused by a virus transmitted by *Myzus persicae*, either alone or in combination with X. Double virus aucuba mosaic (A+F) is not very common. The problem of control resolves itself therefore into the control of *M. persicae* and

of the almost ubiquitous virus X. The vector of X is unknown and it is uncertain whether it is economically possible or necessary to control it as well as the aphid-borne viruses. The useful life of a variety depends on its reactions to local viruses, carriers and strong reactors escaping best. Virus Y is rare except in south-eastern England and its control depends upon the use of Scottish and Irish seed potatoes.

SANFORD (G. B.). **Studies on Rhizoctonia solani Kühn. I. Effect of Potato tuber treatment on stem infection six weeks after planting.** —*Sci. Agric.*, xvii, 4, pp. 225–234, 1936. [French summary.]

The experiments discussed in this report were carried out under a wide range of field conditions in Canada and British Columbia in an attempt to determine the controlling effect of the disinfection of potato tubers (mainly of the Early Ohio variety) with mercuric chloride (1 in 500 for five minutes) on the development of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvi, pp. 57, 122, 158], as judged from the severity of the lesions on the stems and the percentage of plants without stem lesions 42 days after planting. The tabulated results showed that in 24 out of a total of 34 tests (70 per cent.) the severity of infection was significantly greater in the plants from untreated tubers heavily infected with sclerotia of *C. solani* than in those from clean, disinfected tubers; there was a tendency for plants raised from apparently clean and non-disinfected tubers to be more severely attacked than those from the treated tubers. The evidence indicated that tuber disinfection would have been valuable in 91 per cent. of the experiments. A basic, although variable, infection was found to be present in all the soils tested, whether of glacial origin or of the black prairie loam type, and independently of the previous crop or of summer fallow. In the 34 experiments an average of 28·7 per cent. of the plants from tubers heavily infected with sclerotia had lesions attributable to the sclerotia, and, adding the percentage infection arising from the soil, the average was 42 per cent. The method of tuber disinfection adopted apparently caused as many missing hills as the fungus from the sclerotia, the average percentage of missing hills in all the experiments being approximately 2·5.

NĚMEC (A.). **Über den Einfluss des Krebsbefalles auf den Magnesiastoffwechsel der Kartoffelknollen.** [On the influence of wart disease on the magnesia metabolism of Potato tubers.]—*Ernähr. Pfl.*, xxxii, 24, pp. 413–416, 1936. [English and Spanish summaries on p. 432.]

The outcome of the writer's experiments in Czecho-Slovakia on the effect of wart disease (*Synchytrium endobioticum*) on the magnesia metabolism of potato tubers has already been summarized from another source [*R.A.M.*, xvi, p. 120].

FOËX (E.) & LANSADE (M.). **Deux maladies de la Pomme de terre. I. Une fusariose. II. Une bactériose.** [Two Potato diseases. I. A fusariosis. II. A bacteriosis.]—*Ann. Sci. nat., Bot.*, Sér. X, xviii, 2, pp. 141–163, 12 figs., 1936.

This is an expanded account of the writers' studies on the potato

diseases caused by *Fusarium oxysporum* in Brittany and Morocco and *Bacterium xanthochlorum* in Brittany, a preliminary note on which has already been published [*R.A.M.*, xv, p. 680].

YOSHII (H.). **Pathological studies on Rice blast, caused by Piricularia oryzae. I. Some studies on the physiology of the pathogene. II. On the mode of infection of the pathogene.**—*Ann. phytopath. Soc. Japan*, vi, 3, pp. 199–218, 1 pl., 15 figs., 1936. [Japanese, with English summary.]

Piricularia oryzae, the agent of rice blast in Japan [*R.A.M.*, xvi, p. 202], is stated to be incapable of growth under anaerobic conditions. The optimum temperature for the development of the fungus is 28° C. It does not reduce nitrate and appears to be injured by nitrite. Glucose, cellulose, and pectin are valuable sources of carbon. Oxidase and dehydrase were detected in cultures of the organism.

In inoculation experiments with *P. oryzae* on young tillering rice blades, the fungus first forms brown appressoria on the host and then penetrates the epidermal cell through the outer membrane. The motor and accessory stomatal cells appear to be the most susceptible to the fungus. The ears are penetrated similarly to the blades but less readily, infection taking place primarily through the long cells on the upper part of the assimilatory parenchyma near the nodes of the racheae and through those of the bracts projecting from the basal nodes of the ears. Penetration is effected by a slender infection hypha which emerges from the centre of the appressorium, pierces the outer layer of the epidermal membrane, and enters the cavity of the first cell encountered. On reaching the inner surface of the membrane the hypha forms a small vesicle, from which are extruded branches of new vegetative hyphae.

KUILMAN (L. W.). **Symptomen van de mentek-ziekte van de Rijstplant.** [Symptoms of the 'mentek' disease of the Rice plant.]—*Landbouw*, xii, 5, pp. 225–245, 3 figs., 1 graph, 1936. [English summary.]

The foliar chlorosis associated with the 'mentek' disease [root rot] of rice in Java [*R.A.M.*, xiv, pp. 152, 743] being a transient and ambiguous manifestation, attention was concentrated on the possible development of more specific symptoms under given environmental conditions. In a field trial at Pekalongan plants of the susceptible Temas variety transplanted in December and January, 1935–6, showed a striking curtailment of the leaf blades and sheaths, accompanied by the typical yellowing; earing was frequently incomplete, and the stalks, when formed, were abnormally short. In water culture experiments these symptoms were successfully reproduced by the withdrawal of potash from the nutrient solution, the stunting of the leaves beginning to be noticeable at the 40th day, while the older foliage became markedly chlorotic. The latter feature alone resulted from nitrogen or phosphate deficiency, so that the leaf curtailment is evidently a specific sequel to potash starvation in pot tests, though whether the shortage operates similarly in the field has yet to be investigated. If so, the disorder can probably be prevented by the accumulation of a

sufficiency of potash by the seedlings during their cultivation in the nursery.

Suzuki (H.). **Studies on bacteria internal of Rice seeds. V. Influence of hydrogen ion concentration of the media, in which the bacteria are suspended, on the thermal death time.**—*Ann. phytopath. Soc. Japan*, vi, 3, pp. 219–253, 15 graphs, 1936. [Japanese, with English summary.]

A fully tabulated account is given of the writer's studies on the influence of the hydrogen-ion concentration of the medium (bouillon nutrient broth) on the 'thermal death times' of *Bacillus* A, B, and C, found in the interior of rice seeds in Japan [*R.A.M.*, xvi, p. 201]. Irrespective of the strains tested and of temperature relations, the 'thermal death times' appeared to be longest at P_H 7 to 7·2, intermediate at 5, and shortest at 8·6 to 8·8. *Bacillus* C showed the strongest resistance to heat and A (except for one strain from Ogami rice) the weakest.

Pfältzer (A.). **Bruine binnenbast.** [Brown bast.]—*Bergcultures*, x, 50, pp. 1565–1573, 1936.

A review is given of the history, symptoms, economic importance, etiology, and control of brown bast of *Hevea* rubber [*R.A.M.*, xii, p. 80], with special reference to Dutch East Indian conditions.

Sreenivasaya (M.). **The present status of the spike problem of Sandal-Santalum album Linn.**—*Proc. Soc. biol. Chemists* (*India*), i, pp. 27–29, 1936.

In this review of the present status of research on spike disease of sandal [*R.A.M.*, xvi, p. 138] the author states that a technique devised for recognizing plants with masked symptoms has made possible the complete destruction of all sources of infection. Extensive ecological surveys have resulted in the discovery of resistance-imparting hosts, and experiments in spiked forest areas where sandal is grown in association with specific hosts have definitely demonstrated that resistance can be imparted [ibid., xiv, p. 478]. Furthermore, as the disease occurs only during well-defined seasons, control need only be practised in certain months of the year. The results obtained are considered to afford every hope that eradication measures against the disease [ibid., xiv, p. 539] will be successful.

Heim (R.) & Bouriquet (L.). **La maladie de l'apoplexie du Giroflier à Madagascar.** [The apoplexy disease of Cloves in Madagascar.]—*C.R. Acad. Agric. Fr.*, xxiii, 1, pp. 25–29, 1937.

Clove trees in the east of Madagascar and on the island of St. Mary have been observed to suffer from a disease termed 'apoplexy', presenting certain analogies with the 'sudden death' of the crop in Zanzibar [see above, p. 301]. A fungus resembling *Hypochnus* coating the tap-roots, and a *Pythium*-like mycorrhizal fungus are common to both healthy and diseased trees and cannot be suspected as the agents of apoplexy. The true origin of the disorder, which is characterized by the formation of tyloses in the vessels, is probably to be sought in the

physiological conditions of the environment, such as the conjunction between a stony sub-soil and certain meteorological and topographical factors.

In the same district the cloves also suffer from a true root rot associated with typical rhizomorphs and a mycelium consisting of brown, sparsely septate hyphae, 4 to 6μ in diameter. The foliage wilts and falls and the trees ultimately die. None of the leaf diseases, caused by *Cephaleuros virescens*, *Mycosphaerella caryophyllata*, *Alternaria* sp., and *Capnodium brasiliense*, is of any economic importance.

LUTHRA (J. C.). **India : some new diseases of Sugar Cane discovered in the Punjab.**—*Int. Bull. Pl. Prot.*, x, 12, p. 262, 1936.

Cytospora sacchari [*R.A.M.*, xiv, p. 348; xvi, p. 207] has been found on the Coimbatore varieties 223, 312, 313, 385, 392, 394, and several others in the Punjab. The symptoms assume a conspicuous form on the rind with formation of spore bodies when the canes are dried or have been buried in the soil. *Cephalosporium sacchari* [ibid., xv, p. 774] causes a wilt of mature plants. Seedling canes are liable to infection by *Helminthosporium* sp., and some cases of root rot have also been observed.

LOCKWOOD (L. B.). **Rhizopus elegans Eidam.**—*Mycologia*, xxviii, 6, pp. 542–546, 1936.

The author points out that the genus *Rhizopus* was established by Ehrenberg in 1820 on a fungus, *R. nigricans*, which he had previously described as *Mucor stolonifer*, and that it is not possible definitely to identify any species now known with *R. nigricans* Ehrenberg.

In the course of a physiological study of the species of the genera *Mucor* (12 species) and *Rhizopus* (18) none of the latter was able to utilize sodium nitrate as a nitrogen source, while all of the former studied utilize it readily. Several *Rhizopus* cultures produced large quantities of lactic acid from glucose, but no *Mucor* gave an appreciable yield of lactic acid.

STEVENSON (J. A.) & CASH (EDITH K.). **The new fungus names proposed by C. G. Lloyd.**—*Bull. Lloyd Libr.* 35, Mycol. Ser. 8, 209 pp., 1936.

This is an annotated list with citations of 56 genera, 1,094 species, and 38 varieties or forms named as new by the late C. G. Lloyd, together with 392 species transferred by him to other genera. A further genus and 7 species omitted are listed on a mimeographed slip.

SCHADE (A. L.). **A preliminary list of the parasitic fungi of Idaho.**—*Plant Dis. Reptr, Suppl.* 95, pp. 77–113, 1936. [Mimeographed.]

A preliminary list is given of 215 fungi and bacteria parasitic on herbaceous plants (mostly cultivated) in Idaho, together with a host index and a bibliography of 62 titles.

MARTIN (G. W.). **A key to the families of fungi exclusive of the lichens.**—*Univ. Ia Stud. nat. Hist.*, xvii, 3, pp. 83–115, 1936.

The dichotomous key to the families of fungi here presented has been developed during the past ten years in connexion with the course in

mycology given at the State University of Iowa and is an attempt to provide a concise outline of the classification of these organisms to supplement those available in the numerous reference volumes on the subject, a partial list of which is appended. With a few exceptions, the many new families proposed in recent years have been excluded from the synopsis. The key is supplemented by a glossary of mycological terms.

Gonçalves da Cunha (A.). **Uredíneas de Portugal.** [Uredineae of Portugal.]—*Bol. Soc. broteriana*, xi, Sér. ii, pp. 169–265, 1936.

An annotated list, supplemented by a bibliography of 49 titles and by fungus and host indexes, is given in alphabetical order of 178 Uredineae collected on economic and ornamental hosts in Portugal, on the lines of Gonzalez Fragoso's flora of the rusts of the Iberian Peninsula [*R.A.M.*, iv, p. 636].

Lepik (E.). **Einige bemerkenswerte Uredineenfunde aus Estland.** [Some noteworthy finds of Uredineae from Estonia.]—*Ann. mycol., Berl.*, xxxiv, 6, pp. 435–441, 1936.

An annotated list is given of 15 Estonian Uredineae of general phytogeographical interest, several of which are new to the country, including *Uropyxis mirabilissima* [*Cumminsiella sanguinea*: *R.A.M.*, xv, p. 230] on *Mahonia* [*Berberis*] *aquifolium* and *Puccinia antirrhini* on *Antirrhinum majus* [ibid., xvi, p. 256]. *Cronartium asclepiadeum* (*C. flaccidum*) [ibid., xv, p. 617] was observed on *Vincetoxicum rehmanni*, a new host.

Lavroff (N. N.). Новые и более редкие головневые грибы сем. **Ustilaginaceae** северной и центральной Азии. [New and less common smut fungi of the Ustilaginaceae in Northern and Central Asia.]—Reprinted from *Trav. Inst. sci. Biol. Univ. Tomsk*, ii, 35 pp., 1 pl., 3 graphs, 1936. [Latin summary.]

This paper consists mainly of an annotated list of 50 species and varieties of smuts (Ustilaginaceae) recorded from northern and central Asia, all on wild plants except *Ustilago trichophora* var. *pacifica* Lavroff (syn. *U. panici-frumentacei*) [*R.A.M.*, xii, p. 10] on *Panicum frumentaceum* [*Echinochloa frumentacea*]. A number of species and varieties are described as new (with Latin diagnoses), and a new genus, *Tranzscheliella*, is erected for a fungus on *Stipa* spp. with chlamydospores bearing one or two hyaline ellipsoidal lateral appendages, frequently serving to unite the spores in clumps of 10 to 20. The genus *Sorosporium* is divided into two sub-genera, namely, *Eusorosporium*, with light coloured, frequently ochraceous spores agglomerated into compact balls, and *Sorosporella*, with dark spores united in less compact balls.

Sydow (H.). **Novae fungorum species.—XXIV.** [New species of fungi.—XXIV.]—*Ann. mycol., Berl.*, xxxiv, 6, pp. 411–422, 1936.

Continuing his critical annotations of specimens of fungi collected in various parts of the world [*R.A.M.*, xv, p. 398], the writer gives Latin and German diagnoses of a further nine species, of which the following

may be mentioned. Well-defined, brown to reddish-brown lesions, 1 to several cm. in length, extending from the tip along the margins, are formed on the fading leaves of a cultivated *Rhododendron* (?*R. ponticum*) in Westphalia by *Sphaerulina rhododendri* n.sp.

Living leaves of *Ulmus davidiana* in Hopei, China, are attacked by *Stegophora aemula* n.sp., the stromata of which are aggregated in irregular groups, 3 to 10 mm. in diameter, on both surfaces, producing ill-defined, dark rust- or reddish-brown lesions. The depressed and obliquely ellipsoid or spherical, laterally ostiolate perithecia, 200 to 320 μ in diameter, mostly occur in groups of 2 to 5 in a stroma. The numerous clavate or somewhat fusiform asci measure 36 to 50 by 7 to 10 μ and contain eight elongated-clavate, straight or slightly curved, uniseptate ascospores, 8 to 12 by 4 to 5 μ, the basal cell almost hemispherical or bluntly conical, and measuring about 2·5 μ both in length and width. This species differs from the closely related *Gnomonia ulmea* [ibid., xiv, p. 203] in the mode of growth of its fructifications, its relatively poor stromatal development, and active parasitism on elm leaves in contrast to the semi-saprophytic habit of the North American fungus.

Polystigma deformans n.sp. involves entire shoots of young apricots at Peiping [Pekin] in a witches' broom-like malformation, inducing a dark reddish-brown discoloration of the leaves, the tissue of which is ultimately almost completely destroyed by the extensive stroma. The slightly depressed-globose or broadly ellipsoid perithecia, 200 to 280 μ in diameter, are furnished with an obtusely conical or papilliform ostiole, up to 70 by 50 μ, at the apex of which the cells abruptly turn dark olive- or blackish-brown and form a small, spherical, epidermal clypeus. The clavate, stipitate asci measure 45 to 55 by 13 to 17 μ and contain eight elongated-oval or ellipsoid, straight, unicellular, hyaline ascospores, 12 to 15 by 5 to 6 μ. The conidial stage develops in locules on a stroma, and the falcate, S-, or spiral-shaped conidia, 30 to 48 by 0·6 to 1 μ, are borne on rod-shaped, apically tapering conidiophores, 10 to 15 or up to 17 by 2 to 2·5 μ, and are exuded in bright amber- or pale orange-yellow cirrhi.

Dying leaves of *Paspalum dilatatum* in the Argentine bore large, amphigenous, greyish-brown spots caused by *Ascochytula paspali* n.sp.

Muller (A. S.) & Chupp (C.). **Uma segunda contribuição a 's Cercosporae de Minas Geraes.** [A second contribution to the *Cercosporae* of Minas Geraes.]—*Arq. Inst. Biol. veg.*, iii, 1, pp. 91–98, 1936. [English summary.]

An annotated list is given of 52 species of *Cercospora* collected in Minas Geraes, Brazil, during the last two years [*R.A.M.*, xv, p. 59]. Twelve are new to science and are furnished with diagnoses in Portuguese and with critical and taxonomic notes. *C. castaneae* n.sp. forms large, grey lesions with irregular margins on chestnut (*Castanea sativa*) foliage; an extensive stroma is produced, and the obclavulate, curved, indistinctly septate, greenish-olivaceous conidia, 30 to 50 by 2 to 3 μ, are borne on pale grey or olivaceous-fuliginous, undulate conidiophores, 3 to 4 μ in diameter, some 250 by 4 to 6 μ. *C. dianthi* n.sp. attacks the leaves, pedicels, and floral elements of *Dianthus*. *Jasminum grandiflora*

is parasitized by *C. jasminicola* n.sp. *C. krugiana* n.sp., which forms irregular, angular, dark grey spots, 0·5 cm. in diameter, on the upper leaf surfaces of *Boehmeria nivea*, is characterized by grey, distinctly septate, sparsely fasciculate conidiophores, 30 to 110 by 4·5 to 6 μ, bearing obclavulate, usually somewhat curved, hyaline conidia truncate at the base, tapering at the apex, 40 to 110 by 2·5 to 4 μ. *C. krugiana* differs from *C. boehmeriae* in the absence of a stroma and of dense fascicles of conidiophores, the colour of which is quasi-hyaline in the latter, while the conidia are faintly tinted and frequently subcylindrical. *C. leguminosae* Chupp & Linder occurs on *Crotalaria stipularis*. *Sida micrantha* is liable to infection by *Cercospora micranthae* n.sp. The lesions formed on poppy (*Papaver* sp.) by *C. papaveri* n.sp. are circular or irregular, 3 to 8 mm. in diameter, sometimes with an ashen centre bordered by a dark line. *Passiflora* sp. bears irregular, angular, grey spots due to *C. passiflorae* n.sp., which is characterized by pale olivaceous, almost or quite straight conidiophores, 10 to 50 by 3 to 4 μ, producing mainly cylindrical, pale olivaceous, indistinctly 1- to 5-septate conidia, truncate at the base, tapering towards the apex, and measuring 40 to 60 by 2·5 to 4 μ. *C. petuniae* n.sp., the agent of dark grey, narrow-edged, sometimes raised, circular or semi-circular spots on *Petunia* sp., resembles *C. canescens* [ibid., xv, pp. 344, 830] in its obclavulate, straight or slightly curved, hyaline conidia, 50 to 130 by 3 to 4·5 μ. *Wistaria* sp. shows the presence of subcircular or angular, pale yellow, gradually darkening spots, with white centres and orange or dark grey margins, caused by *C. wistariae* n.sp.

Ghimpu (V.). **Afecțiunile patologice și inamicii Tutunului în România și diferite experiențe in 1936.** [Pathological conditions and pests of Tobacco in Rumania and various experiments during 1936.]—*Bul. Cultiv. Ferment. Tutun.*, xxv, 4, pp. 400–406, 1936. [French summary.]

During 1936 tobacco in Rumania became affected by green mosaic [*R.A.M.*, xiv, p. 685], yellow mosaic [ibid., xvi, p. 129] and ring spot [ibid., xv, p. 831]. It was found that only the virus of green mosaic remained viable in tobacco offal from the drying and fermentation sheds after five years. Ninety per cent. of the plants found to be virus-infected at the beginning of vegetation were dwarfed and useless for planting. Disinfection of the hands by washing twice with soap proved to be effective, whereas alcohol and mercuric chloride were unsatisfactory.

Severe losses were caused in many plantations by *Bacterium tabacum* [ibid., xvi, p. 214]. *Rhizoctonia* [*Corticium*] *solani* occurred in seed-beds [ibid., xv, p. 323], and *Phyllosticta nicotianae*, *Alternaria tenuis*, and *Erysiphe cichoracearum* in the field.

Best (R. J.) & Samuel (G.). **The effect of various chemical treatments on the activity of the viruses of Tomato spotted wilt and Tobacco mosaic.**—*Ann. appl. Biol.*, xxiii, 4, pp. 759–780, 1 pl., 2 graphs, 1936.

In continuation of their studies on the inactivation of the viruses of tomato spotted wilt and tobacco mosaic [*R.A.M.*, xvi, p. 68] the authors give an account of experiments the results of which showed

that by excluding free oxygen the concentration of active units of spotted wilt in suspensions stored at 0° C. in a buffer solution of P_H 7 was maintained without loss for 11 hours, while a significant fall in concentration occurred in similar solutions through which air was bubbled. The fact that at room temperatures the virus was fairly rapidly inactivated, though at variable rates, even in the absence of free oxygen, is considered to indicate that inactivation was due to the presence in the infective juice of some oxidized substance, usually present in small but variable amounts, and that it is reduced by certain reducing agents, which arrest further anaerobic inactivation. The addition of these substances in the reduced form yielded suspensions with an E_h (potential at the hydrogen electrode) value of +0·1 volt or less at P_H 7, and of them cystein, in particular, caused a significant increase in the number of lesions obtained. These reducing agents protected the virus against inactivation when exposed to air, in that they prolonged the activity of the inocula for many hours beyond that of the controls. On the other hand, the spotted wilt virus was rapidly inactivated *in vitro* by 0·001 *M* solutions of oxidizing agents which induced in the suspensions a potential greater than +0·2 volts at P_H 7, but, except for methylene blue, not by those which gave a suspension with an E_h value below +0·1 volt. Among the other substances studied, potassium cyanide in 0·01 *M* solution protected the virus both against aerobic and anaerobic inactivation, and mercuric chloride in 0·001 *M* solution caused instantaneous inactivation; catechol, quinol, and phenol alone inactivated the virus in the presence of air, but not if sodium sulphite was also present; it is thought that secondary oxidation products caused the inactivation observed. All attempts to reactivate virus which had been inactivated by exposure to air or with mercuric chloride gave negative results. Evidence is adduced showing that the inactivation observed was due to an action of the agents on the virus itself.

The action of 15 chemicals on tobacco mosaic virus was investigated, but only potassium permanganate and chlorazene induced rapid inactivation. Benzoquinone, iodine, potassium ferricyanide, iodoxybenzene, potassium cyanide (0·01 *M*), and a number of well-known reducing agents covering the potential range down to that of the hydrogen electrode at P_H 7, did not affect the activity of the virus over the relatively short periods of time tested, but potassium bichromate (0·005 *M*) appeared to have a slight inactivating effect after 4 hours' contact. The activity of the virus was not affected by contact with mercuric chloride for a few hours, complete inactivation resulting, however, from contact for longer periods.

Best (R. J.). **The relationship between the activity of Tobacco mosaic virus suspensions and hydrion concentration over the P_H range 5 to 10.**—*Aust. J. exp. Biol. med. Sci.* xiv, 4, pp. 323–328, 1 graph, 1936.

The percentage inactivation of the tobacco mosaic virus in buffer solutions as estimated by the primary lesion method has been determined for various P_H values over the range from 5 to 10 [*R.A.M.*, xv, p. 531, and preceding abstract]. Inactivation of suspensions of the virus

from *Nicotiana* commenced at a P_H value of about 7·8 and the inactivated fraction became progressively larger with each rise in the P_H values until at 10·2 only about 0·5 per cent. of the virus added remained active. Between the values of P_H 8 and 8·9, corresponding to 21 and 90 per cent. inactivation, respectively, the ratio $[H^+]/[\text{active virus}]$ [i.e. free hydrogen ions to fraction of virus remaining active] was found to be a constant, but this relationship did not hold good at P_H values below 8. It is concluded that inactivation of the virus is associated with the neutralization of acidic groups. The inactivation is irreversible, reactivation by the readjustment of the P_H value back to 7 being impracticable. The fact that the 'steady state' requires several hours for its attainment suggests the likelihood of intramolecular changes, with the possibility of a series of complex reactions culminating in an irreversible change to a sparingly soluble product with a constant active mass. From a consideration of contemporary views on the nature of certain enzymes it would appear probable that the tobacco mosaic virus represents a protein complex with one or more prosthetic groups, which are inactivated in weakly alkaline solutions to a given extent dependent on the hydrogen-ion or hydroxyl-ion concentration.

CALDWELL (J.). **The agent of virus disease in plants.**—*Nature, Lond.*, cxxxviii, 3503, p. 1065, 1936.

In this review of recent work on tobacco mosaic the author states that experiments at Exeter have shown that virus activity seems to be associated more with the activity of growing cells than with the movement of materials from the inoculated leaves. When one group of tobacco plants was inoculated on the youngest available leaf, a second on a half-grown leaf, and a third on the oldest leaf (all the plants being in the 4th to 5th leaf stage), and the inoculated leaves at once covered with tinfoil or black paper, symptoms appeared first on the plants of group one, then on most of those in group two, and rarely on the plants in group three. The inoculated leaves in groups one and two grew rapidly, while the adult leaves of the third group died in a week. It was apparent that the virus moved rapidly out of the younger leaves, this movement being little affected by the movement of food materials into them.

WYCKOFF (R. W. G.) & COREY (R. B.). **The ultracentrifugal crystallization of Tobacco mosaic virus protein.**—*Science*, N.S., lxxxiv, 2199, p. 513, 1936.

The authors state that by centrifuging the clear juice from plants infected with tobacco mosaic [*R.A.M.*, xvi, p. 281] at 25,000 r.p.m. they obtained a crystalline deposit presenting an X-ray diffraction pattern indistinguishable from that given by the purified virus protein prepared by chemical means from the juice; this is interpreted as denoting that these two substances are substantially identical.

BAWDEN (F. C.), PIRIE (N. W.), BERNAL (J. D.), & FANKUCHEN (I.). **Liquid crystalline substances from virus-infected plants.**—*Nature, Lond.*, cxxxviii, 3503, pp. 1051–1052, 3 figs., 1936.

By further purification of the crystalline proteins prepared from the

strains of tobacco mosaic virus causing common tobacco mosaic, aucuba mosaic, and enation mosaic the authors have obtained the protein in liquid crystalline states. Sap of mosaic-infected tobacco and tomato plants after centrifuging contains five to ten times as much protein as yielded by healthy plants. This extra protein is precipitated from dilute salt solutions at approximately P_H 3·4 and from neutral solutions with from 10 to 12 per cent. ammonium sulphate. The yield of protein is 1 to 2 gm. per l. of sap. No gross chemical or physical differences were found between the three proteins, each reproducing its characteristic disease when inoculated into susceptible plants. Plants inoculated with 1 c.c. of solution containing 10^{-9} gm. usually became infected, and occasional infections followed inoculations of 10^{-11} gm.

In concentrations over 2 per cent. the highly purified solutions separated into a lower liquid crystalline layer and an upper layer showing optical anisotropy when flowing. The two liquid layers formed gels on drying. X-ray investigations [see preceding abstract] showed a common pattern corresponding to a repeat unit of $3 \times 22{\cdot}2$ A in the crystal, liquid, and gel stages, while other features of the X-ray pattern indicated hexagonal close-packing in the gel stage, and parallel, charged, rod-like molecules in solution estimated to be over 1,000 A in length and about one-tenth as wide. This corresponds with a molecular weight agreeing with Svedberg's estimate of 17×10^6 [*R.A.M.*, xvi, p. 212]. It seems probable, though it has not yet been proved, that these rods are the virus particles.

GOWEN (J. W.) & PRICE (W. C.). **Inactivation of Tobacco-mosaic virus by X-rays.**—*Science*, N.S., lxxxiv, 2189, pp. 536–537, 1 graph, 1936.

The authors state that the results of their experiments [some technical details of which are given] have shown that the survival ratios for purified tobacco mosaic virus [see preceding abstract], as determined by the local lesion method on leaves of *Phaseolus vulgaris*, after exposure to the action of X-rays, follow a simple exponential curve, similar to that which is applicable to the killing of many living entities by X-rays, and especially of *Drosophila melanogaster* sperm. The curve further suggests that the absorption of a single unit of energy in a virus particle is sufficient to cause the inactivation of the particle. A certain parallelism is manifest between the virus particles and genes [*R.A.M.*, xvi, p. 115]; both are estimated to be of the same order of size, are incapable of reproduction outside living cells, produce the same effects, such as, for instance, variegation or mottling in plants, and, under natural conditions, both are capable of mutating to new forms which retain the ability to reproduce themselves. The inactivation of the tobacco mosaic virus by the radiant energy of X-rays and (according to yet unpublished data) of ultra-violet bands in a manner similar to that of genes, also suggests that this energy brings about an alteration in the virus particles comparable to that which takes place in the genes. The virus differs, however, from the latter in being able to move from cell to cell and in being capable of inoculation into the cells of healthy plants.

Kosmodemianski (V. N.) & Levykh (P. M.). Устойчивость сортов Табака и диких видов **Nicotiana** к поражению **Thielaviopsis basicola** (корневая гниль). [Resistance of Tobacco varieties and of wild species of *Nicotiana* to attack by *Thielaviopsis basicola* (root rot).]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 132, pp. 5–17, 1936. [English summary.]

A tabulated account is given of the tests of 125 varieties of tobacco of different geographical origin, and of nine wild species of *Nicotiana* for resistance to root rot (*Thielaviopsis basicola*) [*R.A.M.*, xv, p. 751; xvi, p. 130], which were made from 1931 to 1935, inclusive, in the Sotchi [Caucasian littoral of the Black Sea] region. The disease is stated to be widespread wherever tobacco is grown in Russia and the Ukraine, but is most important economically on the north-east and east coasts of the Black Sea, where it causes losses as high as 68·8 per cent. of the crop in some localities, the average annual loss for the whole territory being about 5 per cent. of the total tobacco production. The results showed that the resistance of a variety cannot be accurately estimated solely by its behaviour in the seed-bed or in the field, and counts of diseased plants in the tests were made under both conditions. Grouped by their origin, the tobacco varieties from south-west Russia, the Balkans, Italy, the southern Central European countries, and north-west Africa included the largest number of resistant strains, while the North and South American varieties exhibited the least degree of resistance. Most of the Crimean, Caucasian, and Turkish varieties were more or less susceptible, but a few exhibited a high degree of resistance, including some lines isolated from the Trebizond tobaccos, among which No. 1867 is very promising. Special mention is also made of the Russian varieties Dubeck Derekoyski No. 1728, American No. 1729, Perekonetzki No. 1257, Tyk-Kulak No. 235, and American No. 47, which in the tests did not show over 1 per cent. infection. Among the wild species of *Nicotiana* complete immunity from *T. basicola* was found in *N. glauca*, *N. repanda*, and *N. noctiflora*, while *N. glutinosa* and *N. sylvestris* were weakly susceptible.

Berkeley (G. H.). **A strain of the virus which causes streak in Tomato.**—*Canad. J. Res.*, xiv, Sect. C, 12, pp. 419–424, 3 pl., 1936.

The results are tabulated and discussed of a two years' comparative study of the symptoms produced by a strain of tomato streak virus 1 found in Ontario (on greenhouse tomatoes and field tobacco) [*R.A.M.*, xv, p. 122], tobacco virus 1 (tomatoes and tobacco) [ibid., xvi, p. 285], and tomato streak virus 1 (from tomatoes and tobacco in Ontario and also from England) on 19 tobacco varieties and 9 other hosts.

On some tobacco varieties tomato streak virus 1 produced primary local necrotic lesions with or without secondary systemic necrosis and stunting, while on others it produced yellow areas followed by secondary systemic mottling without necrosis. The Ontario strain of tomato streak virus 1 produced symptoms identical with those of tomato streak virus 1 on the Standup Resistant, Halley's and Harrow Velvet

tobacco varieties, but on White Burley, Kelley's, Little Orinoco, and Greenwood tobacco the primary local necrotic lesions were followed by systemic mottling with distortion instead of systemic necrosis. On *Nicotiana sylvestris* it produced local necrotic lesions followed by systemic mottling, the mottled leaves in turn becoming slightly necrotic, whereas tomato streak virus 1 on the same host gave rise to local necrotic lesions sometimes followed by systemic necrosis. The Ontario strain of tomato streak virus 1 always produced local necrotic lesions followed by systemic mottling on rubbed leaves of White Burley tobacco, while on petunia it produced necrotic local lesions sometimes followed by systemic necrosis. Tobacco virus 1 produced systemic mottling with some distortion but no local necrosis on all the tobacco varieties tested, petunia, and *N. sylvestris*. It is evident therefore that the three viruses can be readily separated by the symptoms produced on these hosts.

In field inoculations of seven tobacco varieties using plants about 8 in. high tomato streak virus 1 killed off the plants of several varieties in two weeks, whereas the Ontario strain caused only stunting with systemic mottling of leaf tissue on the same varieties. Tobacco virus 1 produced only systemic mottling and stunting on all varieties.

Tests on reaction to heat and ageing showed that tomato streak virus 1, the Ontario strain, and tobacco virus 1 were each viable after six months and rendered inactive after 10 minutes at 90° C. Tobacco virus 1 immunized plants against either of the other viruses. On these grounds it is suggested that tomato streak virus 1 and the Ontario strain of the virus may be strains of tobacco virus 1.

GOIDÀNICH (G.). **Ricerche sulle 'Phytophthorae' del Pomodoro. II. Marciumi del fusto causati da 'Phytophthora infestans' (Mont.). De By. con nozioni sulla specializzazione biologica di questo parassita.** [Researches on species of *Phytophthora* attacking Tomato. II. Stem rots caused by *Phytophthora infestans* (Mont.) De By. with observations on the biologic specialization of this parasite.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 175–182, 2 pl., 2 figs., 1936.

This account of the stem infection of tomatoes in Italy by a physiologic form of *Phytophthora infestans* probably distinct from that attacking the leaves is an expanded version of a paper already noticed from another source [*R.A.M.*, xvi, p. 132].

HILBORN (H. T.) & STEINMETZ (F. H.). **Some epixylous fungi of Maine.** —*Plant Dis. Reptr*, xx, 19, pp. 306–309, 1936. [Mimeographed.]

A list is given of 73 wood-inhabiting fungi collected in Maine from 1933 to 1935.

LIESE (J.). **Über die Hexenbesenbildung der Waldbäume.** [On witches' broom formation in forest trees.]—*Wien. allg. Forst- u. Jagdztg*, liv, 51, p. 230, 3 figs., 1936.

Popular notes are given on the development of 'witches' brooms' in forest trees in Germany, three categories being recognized, namely, the malformations caused by *Taphrina* spp. [*R.A.M.*, vi, p. 586 *et passim*]

on hardwoods, those due to the rust *Melampsorella caryophyllacearum* on spruce [ibid., x, p. 764], and the excrescences induced by hereditary mutations in firs and pines [ibid., xiii, p. 202]. *M. caryophyllacearum* may also be the cause of cankers that considerably reduce the value of the spruce timber, but otherwise the conditions under discussion are of little or no economic importance and do not call for any special silvicultural measures.

GRAHAM (T. W.). **Persistence of Ceratostomella ulmi in stumps of eradicated Dutch Elm diseased trees in New Jersey.**—*Plant Dis. Reptr*, xx, 20, pp. 320–322, 1936. [Mimeographed.]

A survey in April and May, 1936, of the barked, creosoted stumps of elms cut down in New Jersey during 1933 and 1934 in the course of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xvi, p. 217] eradication campaign showed that the fungus was isolated from 11·3 per cent. of the samples, being found on 23·1 per cent. of the living stumps, 4·0 per cent. of those dead, and 11·3 per cent. of those undetermined. None of the sprouts was infected, but *C. ulmi* was isolated from 19 per cent. of the sprouted stumps. Preliminary tests indicated that proper treatment of the stumps with copper sulphate [ibid., xv, p. 327] kills a very high percentage of them and reduces the period of survival of *C. ulmi* in the stumps.

FRON (G.). **La maladie de l'Orme.** [The Elm disease.]—*C.R. Acad. Agric. Fr.*, xxii, 31, pp. 1081–1089, 1936.

In this paper, preceded by an introductory note (pp. 1078–1081) by Lafosse, the writer summarizes the mode of infection and symptoms of the elm disease (*Ceratostomella ulmi*) and describes his experiments near Bordeaux and at Vincennes, Paris, in its control by neutral ortho-oxyquinoline sulphate [*R.A.M.*, xv, p. 584] (sold under the name of cryptonol [ibid., xiv, p. 552] or sunoxol [ibid., xiii, p. 335]). The preparation may be applied by the injection of a solution of 1 in 20,000, by immersion of the roots for six hours in a solution of similar strength, or by the regular watering of the trees at the rate of 10 l. per tree of a solution of the same concentration. The last-named method has been used with promising results on 17 trees of *Ulmus vegeta*, the treatments being given at fortnightly intervals from 15th May to mid-September; observations on the recovery of these elms are still in progress.

Summary of legislation affecting the introduction of plants etc. in Mauritius.—3 pp., 1936.

Proclamation 10 of 1936 [cf. *R.A.M.*, viii, p. 480], superseding Proclamations 40 of 1928 and 25 of 1932, prohibits the importation into Mauritius from all countries of earth and leaf and garden mould, live plants or any part thereof of all kinds in any description of earth or mould, dung or animal droppings (except from Rodrigues, whence a permit is required, and excluding guano), forage, timber with the bark adhering, and (from Réunion only) plant seeds for use as green dressing. Subject to official permission and inspection the importation is authorized of sugar-canes and cuttings thereof, live plants and all parts thereof, and all seeds and fresh fruits. Potatoes

from all countries must be accompanied by a duly authenticated certificate guaranteeing the absence of *Synchytrium endobioticum* from the place of cultivation.

Colony of Sierra Leone. Order in Council No. 5 of 1936.—6 pp., 1936.

The order dated 11th April, 1936, prohibits the importation of soil into Sierra Leone except with the permission of the Director of Agriculture. Apart from seeds from temperate countries and products for consumption, the importation from the Gambia, Gold Coast, and Nigeria of plants and seeds of avocado, cacao, cotton (free from lint), sugar-cane, and all species of *Musa* is permitted only with the consent of the Director of Agriculture, and of citrus, guinea corn [*Sorghum vulgare*], maize, mango, millets, rice, and tobacco only by the Department of Agriculture for scientific purposes. All consignments of plants and seeds from other countries must be certified free from disease; importation from such countries of plants and seeds of cassava, coconut, kola [*Cola acuminata*], sweet potato, yam, and rubber is permitted only under permit, and plants and seeds of avocado, cacao, citrus, coffee, cotton, ginger, guinea corn, maize, mango, millets, oil palm, pineapple, pulses, rice, sugar-cane, tobacco, all species of *Musa*, and all plants from Central and South America and West Indies and other countries where witches' broom of cacao [*Marasmius perniciosus*] is known to occur, may be imported by the Department for scientific purposes only.

Importation of Plants Regulation Ordinance, Gold Coast, No. 18 of 1936. Regulations No. 25 of 1936.—6 pp., 1936.

These regulations prohibit the importation of all plants in soil, all plants from Central and South America, Trinidad, and all countries where witches' broom of cacao [*Marasmius perniciosus*] is known to occur except plants required by the Department of Agriculture for scientific purposes, all coco-nuts in husk from Central and South America, Trinidad, Grenada, and St. Vincent, all coffee in cherry unless certified free from mealy pod disease [*Trachysphaera fructigena*], and all cotton seed except such as required by the Department for scientific purposes. The importation of plants and seeds of cacao, cotton, cassava, oil palms, and all species of *Musa* and *Citrus* (comprising Group A) are permitted from countries included in the Plant Interchange Schedule [viz., Gambia, Nigeria, Sierra Leone] only under permit, which is not required for plants and seeds of coco-nut, kola [*Cola acuminata*], groundnuts, yams, guinea corn [*Sorghum vulgare*], millets, maize, rubber, coffee, rice, and pulses (Group B). Importation from countries outside the Schedule of Group A plants shall only be made for scientific purposes and of Group B plants only under permit, excepting coffee, rice, and pulses for consumption. The ports of entry for plant imports are Accra, Winneba, Cape Coast, Saltpond, and Takoradi. The Plants (Injurious Pests) Ordinance, 1923, is repealed.

The Plant Importation and Regulation Ordinance, Gambia Colony, No. 2 of 1936. Regulations No. 11 of 1936.—11 pp., 1936.

This Ordinance and the Regulations made under it are the counter-

part of those of the Gold Coast [see preceding abstract]. The lists of totally prohibited and scheduled plants are the same.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xi, 2, pp. 30–31, 32, 1937.

Chile. Decree No. 628 of 21st October, 1936, published in the *Diario Oficial* of 7th November, provides for the control of citrus gummosis (*Phytophthora citrophthora*) by the prohibition of propagation for commerce of sweet oranges (*Citrus sinensis*) and lemons (*C. limonum*) by means of seeds, cuttings, layers, or shoots. The only citrus plants eligible for sale are those grafted on sour or Seville oranges (*C. aurantium*) propagated solely by seeds, the grafting being effected at a minimum height of 30 cm. from the ground, and the grafted shoot not being allowed to branch less than 20 cm. from the site of grafting. Any material contravening these regulations will be treated, and if necessary destroyed, at the owner's expense, by the Plant Health (Sanidad Vegetal) Service.

Algeria. Potato tubers infected by wart disease (*Synchytrium endobioticum*), or any other disorder subject to official regulations, attacked by dry rot (*Fusarium*), bacterial wet rot, *Phytophthora infestans*, or showing serious damage in a proportion exceeding 3, 4, or 5 per cent. for average tuber weights of 100, 65 to 100, and under 65 gm., respectively are deemed to be unsuitable for planting, and the sale of such tubers for seed is prohibited in Algeria by a Decree of 17th December, 1936.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, ix, 1, pp. 10–11, 1936.

Saxony (Province of), Magdeburg district. An Order of 4th November, 1936, effective as from the 14th (date of publication), provides for the control of wither tip of sour cherries (*Sclerotinia cinerea*) [*S. laxa*: *R.A.M.*, xiii, p. 247] by the excision and burning of infected material coupled with judicious pruning and treating the wounds with oil paint. These measures must be carried out by 10th September each year.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Amendment of regulations governing the entry of Potatoes into the United States.—2 pp., 1936.

Under the terms Amendment No. 3 (1st December, 1936) to the regulations governing the importation of potatoes into the United States (revised) [*R.A.M.*, i, p. 240], potatoes may be imported free of all restrictions until further notice from the Dominion of Canada and Bermuda, and from the States of Chihuahua and Sonora, and the Northern Territory of Baja (formerly designated Lower) California, Mexico (through certain specified ports only) if found free from dangerous diseases and pests on inspection by a qualified representative of the United States Department of Agriculture. This revision further revokes the unrestricted importation of foreign potatoes into the Territory of Hawaii, to which the same regulations are henceforth applicable as to the continental United States and Porto Rico.

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SPRENGEL (F.). **Über die Kropfkrankheit an Eiche, Kiefer, und Fichte.** [Note on the 'goitre' disease of Oak, Pine, and Fir.]—*Phytopath. Z.*, ix, 6, pp. 583–635, 53 figs., 1936.

Under the general term 'Kropf' [goitre] the author describes and discusses the nodosities, frequently attaining considerable dimensions, which in many localities in Germany and elsewhere may develop on stems of oak, pine, and fir, causing considerable depreciation of their value. Most frequently the disease occurs in groups of trees standing close together. The swellings originate from a disturbance in the cambium, and may either remain covered with more or less normal bark, or may assume the aspect of broken-down cankers, affording entry to wound organisms. No clue to the causal agency of the condition was obtained, but the balance of evidence indicated that it may be due to an hereditary predisposition of certain trees to such formation in response to certain unknown environmental factors. Affected trees should not be used either for vegetative or seed propagation, since cuttings from diseased oaks always reproduced the trouble, and young trees in stands should be removed immediately the disease becomes apparent, to prevent them from dropping their seeds.

GOIDÀNICH (G.). **Comportamento dell' 'Ulmus pumila' L. nella pratica agricola e la sua resistenza alla grafiosi.** [The behaviour of *Ulmus pumila* L. in agricultural practice and its resistance to graphiosis.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 199–207, 7 figs., 1936.

Two cases of natural infection by *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xvi, p. 217] of *Ulmus pumila* in Italy are described, one observed in the neighbourhood of Bologna on a tree grafted on *U. campestris* and the other on an ungrafted tree in Forli; the author confirms, however, the resistance of the species to *C. ulmi* and recommends its use for forestry and ornamental purposes and as vine supports [ibid., xiii, p. 481]. The attention of growers is directed to the natural hybrids of *U. pumila* and *U. campestris* or other species, which are probably susceptible and should not be planted. In the province of Bologna *U. pumila* was affected by a tracheomycosis due to *Verticillium albo-atrum* [ibid., xv, p. 474], the symptoms in the wood being almost identical with those due to *C. ulmi*.

Melloni (M.). **Disseccamenti dei rami di Olmo provocati da due sferopsidali.** [Desiccation of Elm branches caused by two Sphaeropsidales.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 208–213, 7 figs., 1936.

Branches of *Ulmus campestris* which had wilted from the apex downwards, the diseased portion being separated off from the healthy part by a crack which laid bare the wood and generally extended all round the branch, were received from Ancona, Italy, and showed the presence of *Cytospora* [*Valsa*] *ambiens* [*R.A.M.*, xv, p. 448] in some cases and *Botryodiplodia malorum* [*Physalospora mutila*: ibid., xi, p. 212; xvi, p. 335] in others.

Inoculations of growing elm branches made by inserting pieces of cultures of the fungi in wounds in the bark gave positive results in one month both when the fungi were used separately and when a mixed inoculum was inserted.

Couderc (M.). **Les porte-greffes du Châtaignier et la maladie de l'encre.** [Chestnut stocks and ink disease.]—*Progr. agric. vitic.*, cvi, 39, pp. 305–308; 41, pp. 352–356; 44, pp. 423–427; 45, pp. 449–452, 8 figs., 1936.

After briefly reviewing recent breeding work against ink disease of the chestnut [*Phytophthora cambivora*: *R.A.M.*, xiii, p. 63; xvi, p. 72] in France, the author describes the botanical characters, and where possible, the commercial potentialities of a number of Chinese and Japanese varieties (out of a total of 550 trees) for use either as stocks for European chestnuts or as direct producers. He states that the results so far obtained indicate that all are resistant to the ink disease, and a study is now being made to find the varieties most suitable for French conditions.

Gäumann (E.). **Der Einfluss der Fällungszeit auf die Dauerhaftigkeit des Buchenholzes.** [The influence of the felling time on the durability of Beech wood.]—*Mitt. schweiz. Zent. Anst. forstl. Versuchsw.*, xix, 2, pp. 382–456, 1 fig., 9 graphs, 1936. [French summary.]

Beech stems felled during the period from December to March underwent no deterioration in the Sihlwald (central Switzerland) in 1933 and 1934 even when left for an entire year in the open. On the other hand, the incidence of decay in the May to June, July to August, and September to November fellings amounted to 21·9, 40·8, and 11·4 per cent., respectively. Compared with the conifers subjected to analogous tests under similar conditions [*R.A.M.*, x, p. 146], beeches proved relatively susceptible to fungal decay, induced chiefly by *Stereum purpureum* [ibid., xi, p. 414], *Hypoxylon coccineum* [ibid., xiii, p. 197], *Schizophyllum commune*, and *Xylaria hypoxylon* [ibid., xi, p. 318], the two latter being only semi-parasitic and commonly found in company with the pure saprophytes, *Polystictus versicolor*, *Polyporus vaporarius* [*Poria vaporaria*], and *Polyporus adustus* [ibid., xvi, p. 4]. The temperature relations of these organisms are so divergent (optimum for *Stereum purpureum* and *H. coccineum* 24° to 27° C., for

Schizophyllum commune 30° to 33°, and for *X. hypoxylon* 15° to 21°) that they may attack the wood at any time of year, provided it is not actually frozen, but the sap is renewed after thawing in the stems felled in the winter and early spring, with the result that tyloses are formed and the cell walls acquire a high degree of resistance to invasion, which is not maintained in the later fellings. The incidence of fungal rotting may be somewhat reduced by leaving the trees lying in the open for a month (until the leaves are wilted) before cutting. Beeches fructify in general every 5 to 7 years, and during this period the resistance of the wood to decay by the saprophytes, *Polystictus versicolor* and *Poria vaporaria*, is increased by one-third to one-half, whereas the reaction to parasites is not affected.

WHETZEL (H. H.) & BUCHWALD (N. F.). **North American species of Sclerotinia and related genera. III. Ciboria acerina.**—*Mycologia*, xxviii, 6, pp. 514–527, 19 figs., 1936.

A description is given of the cultural characters and life-history of a new species of *Ciboria*, named *C. acerina* [with a diagnosis in English], found in New York on the fallen overwintered male and female inflorescences of *Acer rubrum* and on the male inflorescences of *A. saccharinum*, *Myrica gale*, *Salix discolor*, and *Ostrya virginiana*. The fungus has short, stout, 4-spored asci measuring 75 to 107 by 7·5 to 8·8 (average, 92 by 7·7) μ, and ellipsoid, hyaline, smooth, uniseriate ascospores measuring 10 to 15 by 5 to 6 (11·9 by 5·5) μ, slightly flattened on one side, and occupying the upper two-thirds of the ascus.

The inoculation of flowers by allowing ascospores to drop on them resulted in infection of the stamens, through which alone invasion could occur. The female flower parts could not be infected artificially, but are attacked occasionally in nature.

The life-history of the fungus is as follows. The apothecia begin ascospore discharge in late March or early April, as the maple flowers open, and continue for three or four weeks. The ascospores infect the stamens, at least 24 hours' moisture being requisite to ensure infection, and the mycelium invades the tissues of the calyx, pedicels, and bud scales round the flower clusters. These fall and are mummified by the mycelium, from the dense stromata of which one to several apothecia arise in early spring.

Microconidia were produced in culture but have not yet been observed in nature. There is no evidence that the fungus has any true conidial stage.

Annual Report of the Division of Forestry, Union of South Africa, for the year ended 31st March, 1936.—47 pp., 4 pl., 1936.

The following items of phytopathological interest occur in this report. *Armillaria mellea* was fairly active in the Klein Australie and Timbadola pine plantations [*R.A.M.*, xiii, p. 425], where infected trees were grubbed out and burnt. The primary cause of the spasmodic dying-off of pines in the Cape Peninsula appears to be the soil-inhabiting fungus *Rhizoctonia lamellifera* [ibid., xii, p. 727], though the trouble is obviously aggravated by drought. The most promising of the various timber preservatives tested was a creosote oil obtainable to standard

specifications from Iscor, Pretoria. Tan bark wattles [*Acacia* spp.] are subject to an obscure form of gummosis, a serious aspect of which is the liability of the diseased trees to longicorn beetle (*Ceroplesis thunbergii* and *Pyonopsis brachyptera*) infestation.

GAISBERG (ELISABETH V.). **Die Adelopus-Nadelschütte der Douglasie in Württemberg. Vorläufige Mitteilung.** [The *Adelopus* needle fall of the Douglas Fir in Württemberg. Preliminary note.]—*Silva*, xxiv, 51–52, p. 420, 1936.

The needle fall of Douglas firs [*Pseudotsuga taxifolia*] caused by an *Adelopus* [*R.A.M.*, xvi, p. 147 and next abstract] is stated to be spreading northwards in Germany from Upper Suabia, where it was originally located, no doubt as a migrant from Switzerland. The fungus attacks not only the slowly growing mountain forms but also the rapidly developing coastal types, and may induce complete defoliation in extreme cases. Further studies on the disease are in progress.

ROHDE (T.). **Adelopus gäumanni n.sp. und die von ihm hervorgerufene 'Schweizer' Douglasienschütte. Eine vorläufige Mitteilung.** [*Adelopus gäumanni* n.sp. and the 'Swiss' Douglas Fir leaf fall caused by it. A preliminary note.]—*Silva*, xxiv, 51–52, pp. 420–422, 1936.

The genus *Adelopus*, a new species of which is associated with the destructive needle-fall of Douglas firs (*Pseudotsuga taxifolia*) in Austria, Great Britain, Germany, and Switzerland [see preceding abstract], was hitherto represented only by *A. balsamicola* (more correctly named *A. nudus*, as shown by an examination of North American type material), a pure saprophyte restricted to *Abies* spp. The new species is named *A. gäumanni* [with a Latin diagnosis] and is characterized by spherical, dull black perithecia, 32 to 86 μ in height by 41 to 93 μ in diameter (average 65 by 67 μ), with a stalk 7 to 22 μ in thickness (14 μ), containing less than 15 aparaphysate, clavate to cylindrical, often ventricose asci, 24 to 48 by 5 to 16 (36 by 10) μ, occupied by distichous, hyaline ascospores, 9 to 15 by 3·5 to 5·2 (12 by 3·9) μ, with a median septum. The imperfect stage of the fungus has only been observed in pure culture developing on the sparse, black mycelium as a sclerotial mass that disintegrated into oidioid elements. The presence of the oidial phase in *A. gäumanni*, the larger number of asci (15 to 30) in *A. nudus*, and other morphological and cultural characters serve to distinguish the two species, though a close relationship is also apparent between the strictly specialized parasite of *P. taxifolia* and the widespread saprophyte on *Abies*. Inoculation experiments are necessary definitely to establish the presumed etiological connexion between *Adelopus gäumanni* and the Douglas fir needle-fall.

The current season's needles are often shed very early, before the formation of the *Adelopus* fruit bodies, a phenomenon probably due in part to infection by a *Rhizosphaera* previously observed in a similar relationship with *Rhabdocline pseudotsugae* on the same host [*R.A.M.*, xvi, p. 147]. On the other hand, needles infected by *A. gäumanni* may survive for several years, three being the most common period. The mycelium may be present for months in the tissues without inducing any external symptoms, and not until the late autumn or winter is

there any sign of the black hyphal masses that slowly develop into fruit bodies during the next season. Each new needle as it develops is attacked by the fungus, so that ultimately not a sound one remains on the tree. There is reason to believe that older needles are also subject to infection, though in a lesser degree than the young ones.

NĚMEC (A.). **Studie o karenčnich zjevech u Borovice v lesní školce v Řevnicích.** [Studies on deficiency symptoms in Pines in the forest trees nursery at Řevnice.]—*Ann. Acad. tchécosl. Agric.*, xi, 5, pp. 531–534, 1936. [German summary.]

An account is given of an investigation at the forest tree nursery in Řevnice, Czecho-Slovakia, of a pathological condition of pine seedlings (chiefly one-year-old), characterized by a dull violet discoloration of the needles, which is frequently observed in the autumn or after the first few frosts. Analysis of the soil within the rhizosphere of affected and sound seedlings, supported by the chemical analysis of the tissues of healthy and diseased plants, suggested that the condition is due to deficiency of the soil in phosphoric acid and also in lime, and further work is now in hand to determine whether this hypothesis is correct, and whether the trouble may be controlled by adequate fertilization of the soil.

[A German version of this paper is also published in *Forstwiss. Zbl.*, lviii, 23, pp. 798–808, 1936.]

DIMITROFF (T.) & BIOLTSCHEFF (A.). Приносъ къмъ изучване повреж-денията въ нашитѣ гори. [Contribution to the study of damage to our forests.]—*Annu. Univ. Sofia*, xiv, Sect. V, Fasc. 2, pp. 169–203, 1 map, 19 figs., 1936. [French summary.]

In this account of the different kinds of damage that are caused to Bulgarian forest trees, chiefly conifers, by various environmental and other agencies, a few lines are devoted to *Pythium de Baryanum* which, in 1935, caused a destructive blight of pine seedlings in a forest-tree nursery, where soil irrigation was excessive. *Peridermium pini* [*R.A.M.*, xvi, p. 288] was observed in the same year causing severe damage to a 30- to 40-year-old 'white pine' [*Pinus sylvestris*] tree. The Bulgarian native pine (*P. peuce*) is stated to be immune from white pine blister rust (*Cronartium ribicola*) [ibid., xvi, p. 287], and is recommended as a possible substitute for the other European five-needle white pines, all of which are heavily attacked by the parasite. *Chrysomyxa abietis* [ibid., xv, p. 411] caused very severe defoliation in a young stand of spruce.

LIUBARSKI (L. V.). О грибных болезнях леса в Зейском и Рухловском районах ДВК. [Fungal diseases of forest trees in the Zeya and Rukhlovo districts of the Russian Far East.]—*Bull. Far Eastern Br. Acad. Sci. U.S.S.R., 1936*, 17, pp. 79–85, 1936. [English summary.]

As a result of his survey in 1932 of the forests in the river Zeya and the Rukhlovo districts of the Russian Far East, the author states that larch (*Larix dahurica*) stands suffer very considerably from insect attacks and even to a greater degree from trunk and root rots, among which the following are listed as the more important, namely, *Trametes*

[*Fomes*] *pini* [*R.A.M.*, xvi, p. 3], *Fomes officinalis*, *F. annosus* [ibid., xvi, p. 145], *Polyporus schweinitzii* [ibid., xvi, p. 76], and *P. sulphureus* [ibid., xvi, p. 4]. The chief fungal diseases of the pine (mainly *Pinus sylvestris*) are stated to be *Peridermium pini* [see preceding abstract], *F. pini*, *Ceratostomella pilifera* [ibid., xv, p. 69], *Polyporus volvatus*, and *Cronartium quercus* Schroet. [*C. quercuum* Miyake: ibid., xv, p. 124]. The last-named causes the formation on the branches of galls, frequently 30 cm. or more in diameter, and while the rust does not appear to affect the growth of the pine, the large galls often break the branches bearing them, owing to their great weight, thus favouring the infection of the trees by wound parasites. The galls, however, are valuable for the extraction of turpentine, with which they are copiously supplied. The paper contains a full list of the fungi (30) which have been recorded on conifers and the birch (*Betula platyphylla*) in that region.

PILÁT (A.). **Monographie der europäischen Polyporaceen mit besonderer Berücksichtigung ihrer Beziehungen zur Landwirtschaft. III Teil.** [A monograph of the European Polyporaceae with special reference to their connexions with agriculture. Part III.]—*Beih. bot. Zbl.*, Abt. B, lvi, 1–2, pp. 1–82, 8 pl., 11 figs., 1936.

Critical notes are given on the distribution, morphology, taxonomy, and phytopathological significance of 15 European species of the genus *Polyporellus* Karst. which is here used for forms representing a transitional stage between the Polyporaceae and Agaricaceae as exemplified by *Lentinus*. Among the fungi enumerated, the following cause intensive wood rots in Czecho-Slovakia and elsewhere: *P.* (*Polyporus*) *brumalis* [*R.A.M.*, vii, p. 689], *Polyporellus* (*Polyporus*) *arcularius* [ibid., ix, p. 75; xvi, p. 221], *Polyporellus* (*Polyporus*) *squamosus* [ibid., xiv, p. 794], the agent of a white decay of beeches in the Carpathians (including those of the U.S.S.R.), walnuts, and numerous other trees in central European parks, and *Polyporellus* (*Polyporus*) *picipes* [ibid., x, p. 271], causing a white rot of willows and beeches.

SCHMITZ (H.) & KAUFERT (F.). **The effect of certain nitrogenous compounds on the rate of decay of wood.**—*Amer. J. Bot.*, xxiii, 10, pp. 635–638, 1936.

Since the nitrogen requirements of wood-destroying fungi are high and the nitrogen content of wood is low it is conceivable that the rate of decay of wood-destroying fungi may be increased by increasing the available nitrogen [*R.A.M.*, xiii, p. 485]. In the experiments described the addition of asparagin to Norway pine (*Pinus resinosa*) sapwood clearly increased the rate of decay by *Lenzites trabea*. Whereas the average loss in weight of the controls amounted to 32·97 per cent., the average loss in the culture flasks to which 0·1 and 1 per cent. asparagin solutions were added was, respectively, 35·59 and 47·45 per cent. The addition of 1 per cent. asparagin solution to paper birch (*Betula papyrifera*) sapwood increased the rate of decay by *Polystictus versicolor* nearly four times but did not cause consistent differences in the rate of decay of the heartwood. The addition of ammonium nitrate to sapwood and heartwood of Norway pine and paper birch increased the rate of decay caused by the respective fungi only when a 0·5 per

cent. solution was added to Norway pine heartwood. In all other cases, the addition of a 0·5 or 1 per cent. solution of this salt caused significant decreases in the rate of decay. These results suggest that resistance to decay may sometimes be due to the nutritive properties of the wood, the organic nitrogen content of which may play an important part in this connexion.

KAMESAM (S.). **A note on protecting Indian structural timbers against fire, termites, borers and fungi (rot).**—*Indian For. Rec.*, N.S., *Utilization*, i, 4, pp. 93–113, 1936.

This is a concise discussion of certain aspects of timber preservation against fungal and other forms of decay in India. The timbers used for structural purposes are classified on the basis of (*a*) natural durability and the intensity of protective treatment required, and (*b*) amenability to impregnation under pressure with fire-proofing or antiseptic fluids, and some data are given concerning the economics of preservation, with special reference to the ascu process [*R.A.M.*, xvi, p. 146].

BURKE (O. D.) & KIRBY (R. S.). **Control of the diseases of vegetable crops.**—*Circ. Pa agric. Exp. Sta.* 173, 16 pp., 1936.

Popular notes are given on some well-known fungal, bacterial, and virus diseases of the chief vegetable crops of Pennsylvania, accompanied by concise directions for their control by cultural methods, seed treatment, and spraying.

CHAMBERLAIN (E. E.). **Turnip-mosaic. A virus disease of crucifers.**—*N.Z. J. Agric.*, liii, 6, pp. 321–330, 5 figs., 1936.

Turnip mosaic [*R.A.M.*, xiv, p. 731] was first recognized in New Zealand in 1932, when it was found on rape [*Brassica napus*] at the Plant Research Station Area, Palmerston North. Since then it has become a serious disease of swedes, rape, and turnips in the locality mentioned, and has been noted also in a number of districts throughout the Dominion. On swedes the characteristic symptom is a diffused mottling of the leaves, accompanied by crinkling, but occasionally, the mottling consists of dark green, blistered areas. Only leaves developing after infection has taken place are affected. The diseased plants soon become stunted, and the bulbous portion of the root is under-sized and liable to soft rot [*Bacillus carotovorus*: ibid., xv, p. 468]. On turnips the symptoms tend to be more pronounced. In trials conducted in 1934–5, the disease caused a loss of yield on rape equivalent to 25·4 per cent., the figure the following season being 26·1 per cent. The disease was transmitted experimentally by juice inoculations from swede to turnip and swede, and from rape to turnip, by *Brevicoryne brassicae* from swede to swede and turnip, and by *Myzus persicae* from swede, Brussels sprouts, cabbage, broccoli, and cauliflower to swede and vice versa. Attempts at seed transmission were unsuccessful.

In a resistance trial with 70 lines of different swede varieties and strains mosaic became general among the plants, but ten varieties showed from 0 to 78 per cent. mosaic as against an average of 92·7 per cent. for the others. Sutton's Sensation was outstanding in resistance (0·0 per cent. infection though a few plants became infected

later), while Wilhelmsburger Otofte, Imperial (Webb's No. 2 strain), and Sharpe's A 1 were moderately resistant. The control measures recommended in crops grown for seed consist in dipping the leaves at transplanting in nicotine or nicotine sulphate solution, regular roguing of infected plants, avoidance of cruciferous crops in the vicinity, removal of volunteer seedlings, and spraying with nicotine against aphids as soon as the disease appears.

HURST (R. R.) & MACLEOD (D. J.). **Turnip brown rot.**—*Sci. Agric.*, xvii, 4, pp. 209–214, 4 pl., 1936. [French summary.]

Brown heart of turnips [*R.A.M.*, xvi, p. 324] in Canada, as shown by investigations started in 1928, is responsible for heavy annual losses to the growers, an estimate based upon rejections of consignments at shipping points for the United States indicating that the direct cash loss due to this disease may be as high as $50,000 in a single year. Three years' tests in the Maritime Provinces demonstrated that boron is essential for the normal development of turnips, and that brown heart can be controlled by means of this element. Very satisfactory results have been obtained by applications of finely powdered borax at the rate of 15 to 20 lb. per acre, without causing injury to ordinary crops in subsequent rotations; higher doses, however, may be injurious. The borax may be applied in the drill, at the sides of the drill rows, broadcast, or combined with fertilizers or manure and dispersed by means of the ordinary machine spreaders, but the general inclusion of borax with commercial turnip fertilizers is not recommended for the present since additional boron is not always required. Stable manure alone was slightly more effective than fertilizer alone in the control of brown rot, indicating that the former contains traces of boron. Heavy liming of the soil was found to predispose the turnip to the disorder, and borax was less effective in naturally alkaline soils.

WOODCOCK (J. W.). **Brown-heart of Swedes. Dry matter and sugar content of affected roots.**—*N.Z. J. Agric.*, liii, 6, pp. 365–366, 1936.

Analysis of healthy and brown heart swedes [see preceding abstract] of four varieties from different localities in New Zealand showed that in the former the dry matter ranged from 8·5 to 12 per cent. and the sugar from 4·4 to 6·5 per cent., whereas in the latter the corresponding figures were 8·5 to 10·9 and 3·6 to 5·3 per cent.

BÖNING (K.). **Untersuchungen über Meerrettichkrankheiten und deren Bekämpfung.** [Investigations on Horse-radish diseases and their control.]—*Angew. Bot.*, xviii, 6, pp. 482–494, 5 figs., 1936.

The most important horse-radish disease in Bavaria, where this crop constitutes an important source of profit to small-holders, is stated to be white rust [white blister] (*Albugo candida*) [*Cystopus candidus*: *R.A.M.*, xiv, p. 419], which frequently develops on the leaves and petioles in association with *Peronospora parasitica* and is also responsible for a brown rot commencing at the head of the rootstock and extending downwards. Proof has been obtained of the overwintering of the mycelium in the diseased tissues by the planting out in the spring of contaminated material, from which arise shoots with primary infection

in the shape of deformed leaves and petioles covered with the white pustules of the fungus. The control of *C. candidus* presents considerable difficulties. Of the various standard fungicides tested, lime-sulphur is ineffectual and ordinary Bordeaux mixture very injurious to the plants; better but somewhat uncertain results were given by Wacker's Kupferkalk [ibid., xvi, p. 230] and nosprasit 0. There is some promise of the successful development of a Hungarian horse-radish variety combining resistance to white blister with other desirable characters.

Contrary to Klebahn's opinion, the writer maintains that the destructive and widespread root blackening is due to *Verticillium dahliae* [ibid., xiv, p. 419], which may generally be isolated in pure culture and in an extensive series of inoculation experiments successfully reproduced the disease. The few instances in which isolation experiments have failed are attributed to the fact that vascular discoloration occurs in advance of the actual presence of the fungus. The blackening disease is most prevalent in relatively dry soils with little humus, an excess of lime, and a deficiency of any one essential nutrient, all of which factors tend to weaken the constitution of the host and promote the growth of the pathogen. Crop rotation (at most once in four years) and the use of healthy planting stock are the principal measures to be adopted against the fungus which attacks a number of other crops, such as potato, lupins, and clovers, and many weeds. Cuttings destined for planting should be kept until required in fresh, healthy soil, pure sand, or peat mould, or mixtures of these. All the leading varieties (Bavarian, Spreewald, and Silesian) seem to be susceptible to *V. dahliae,* but the existence of individual differences encourages the hope of breeding resistant strains.

Excessive soil moisture predisposes the horse-radish crop to two bacterial diseases, namely, 'core rot' and 'red brittleness', the former characterized by rust-brown circles or half moon-shaped structures in the central cylinder, leading to complete disintegration, and the latter by an external rust-brown discoloration of the root, the healthy tissues of which are generally separated from the diseased by wound cork. Transitional stages of these disorders also occur, in which both external and internal symptoms may be observed. The bacteria isolated from infected roots reproduced most of the foregoing symptoms and are presumably concerned in the etiology of the conditions described. Infection is perpetuated through the soil and by means of contaminated planting stock.

Storage rots are due to common bacterial agents of decay, *Sclerotinia sclerotiorum*, and *Penicillium*.

Crown gall (*Pseudomonas [Bacterium] tumefaciens*) [ibid., xiii, p. 291], like the above-mentioned bacterial diseases, is transmissible by cuttings, which should be dipped before planting in a loam emulsion with the admixture of a dilute disinfectant solution.

Rindler (J.). **Über die Bekämpfung der Blattfleckenkrankheit in Oberösterreich.** [On the control of the leaf spot disease in Upper Austria.]—*Z. Zuckerindustr. čsl. Repub.*, lxi, 17, pp. 135–136; 18, 141–144, 1937.

An account, supplemented by numerous statistical data in tabular

form, is given of recent experiments in the control of beet leaf spot (*Cercospora beticola*) in Upper Austria [*R.A.M.*, xiv, p. 813; xvi, p. 227], where particularly good results have been obtained by five applications of the copper-lime dust (10 per cent. copper) cuprispora Mantov at the rate of 9 to 11 kg. per Joch [15·7 to 19·1 kg. per hect.]. This greenish, amorphous, non-water-soluble powder is also available in a satisfactory liquid form (24 and 40 per cent. cuprispora Mantov). In 1935 the leaf and beet yields on the dusted areas were 21·8 and 16·66 per cent. higher than those on the untreated plots.

Kallbrunner. **Ist das Bespritzen der Rübenblätter mit Kupfersalzen nachteilig für die Verfütterung?** [Is the spraying of Beet leaves with copper salts detrimental for feeding to livestock?]—*Dtsch. landw. Pr.*, lxiii, 52, p. 656, 1936.

According to W. Liebscher, of the Federal Agricultural and Chemical Experiment Station, Vienna, no adverse effects need be expected to follow the use as fodder of beet leaves sprayed with copper salts against *Cercospora* [*beticola*: see preceding abstract] provided the applications are made at least eight weeks before harvest and the foliage is thoroughly fermented in the silo. The consumption by ten cows during 41 days of quantities of fermented beet leaves ranging from 20 to 40 kg. (1·93 to 3·86 gm. copper) did not impair the animals' health, reduce their weight, or affect the composition and consistency of their milk.

Checcucci (G. M.). **Seme nazionale di Bietole zuccherine.** [Indigenous Sugar Beet seed.]—*Industr. saccar. ital.*, xxix, 12, pp. 569–574, 1936.

In connexion with a strenuous campaign for extension of the Italian sugar beet industry, mention is made of the successful efforts of Prof. Munerati in the development, by the hybridization of commercial with native wild strains, of selections retaining their foliage through the hot summer weather without requiring repeated copper treatments against *Cercospora* [*beticola*: *R.A.M.*, ix, p. 576, and preceding abstract]. By means of these strains it is hoped to prolong the present factory season of two months to about double that length of time.

Van Schreven (D. A.). **Kopergebrek bij de Suikerbiet.** [Copper deficiency in Sugar Beet.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z., 1936*, 2, pp. 37–57, 4 figs., 1936. [French summary.]

Hilleshög beet and Victory oats seedlings were grown in water cultures and in nutrient solutions with and without copper, 'Kahlbaum pro analyse' chemicals twice recrystallized in double-distilled water being used. The oats receiving no copper displayed the symptoms of copper deficiency described by Brandenburg [*R.A.M.*, xv, p. 145] at the end of four weeks, while the beets had already begun to manifest traces of chlorosis [ibid., xiv, p. 209] after 19 days, the leaves assuming a mottled pale green to greenish-yellow and bluish-green or dark green coloration and feeling somewhat thinner to the touch than those of the healthy controls given 0·5 mg. copper sulphate per l. of solution. At the end of two months the oldest leaves developed a localized necrosis of the foliar parenchyma, the colour of which ranged from greyish-

brown to grey or white. The diseased foliage produced little or no starch. The lateral roots of copper-deficient beets were generally pure white and longer and more tapering than those of healthy ones, while the tap-root was stunted. Copper would thus seem to be essential to the formation of chlorophyll in beets.

The oats were uprooted after 46 days, at which stage the copper-deficient plants averaged only 25 cm. in height compared with 45 cm. for the healthy controls. The average weight of the tap-roots of copper-deficient beets at the end of 71 days was $10{\cdot}522 \pm 0{\cdot}221$ gm. compared with $30{\cdot}597 \pm 1{\cdot}4$ gm. for those of healthy plants, while the average sugar contents were 15·2 and 16·85 per cent., respectively.

On the basis of these results the copper deficiency disorder must therefore be added to the list of beet diseases characterized by chlorosis [ibid., xv, p. 417].

[An English version of this paper appears in *Phytopathology*, xxvi, 12, pp. 1106–1117, 2 figs., 1936.]

DUNDAS (B.). **Inheritance of resistance to powdery mildew in Beans.**—*Hilgardia*, x, 8, pp. 243–253, 1936.

In this full account of the author's study in California of the inheritance of resistance of bean (*Phaseolus vulgaris*) powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, xiv, 207] it is stated that the Hungarian, Lady Washington, Pinto, and Pink varieties were found to be resistant, and Robust and Red Kidney susceptible as tested by inoculations of detached leaflets on 10 per cent. sucrose solution in Petri dishes, by greenhouse inoculations, and by observations of natural infections in the field. The Frijole negros variety was resistant in the field and greenhouse, and semi-resistant in the dishes, while Long Roman was semi-resistant in the field and greenhouse, and susceptible in the dishes.

Of 45 plants of the F_2 progeny of a cross between Robust and Pinto, 12 were homozygous resistant, 23 heterozygous resistant, and 10 homozygous susceptible. Of 47 resistant plants of the F_2 progeny of a cross between Long Roman and Pinto, 16 were homozygous and 31 heterozygous. Readings of 0 (no mycelium) and t (trace of infection, scant mycelium, no spores) on the scale of infection (0 to 4) adopted in the F_2 plants indicated homozygosity or heterozygosity for resistance, 1 and 2 indicated heterozygosity only, and 3 and 4, homozygosity for susceptibility. In the crosses with Robust and Long Roman, the Pinto variety had a single Mendelian factor pair for resistance.

MOORE (W. D.). **Powdery mildew (Erysiphe polygoni) on garden Snap Beans.**—*Phytopathology*, xxvi, 12, pp. 1135–1144, 2 figs., 1936.

Powdery mildew (*Erysiphe polygoni*) of garden beans (*Phaseolus vulgaris*) [see preceding abstract] is stated to have been assuming increasing importance during the last ten years in the south-eastern United States, especially in the autumn crops, and studies were accordingly carried out from 1931 to 1935 in a vegetable-growing centre of South Carolina on the development and control of the disease. Of the 33 varieties on which observations of natural infection were made, 7 (including the important commercial Bountiful) were severely

attacked, 15 (including Giant Stringless Green Pod, Black Valentine, and Konserva) moderately, and 12 (including Asgrow Valentine and Sure Crop Wax) lightly. Infection having been found consistently to follow the late September and early October rains, the time for initiating control measures can be gauged with a fair amount of accuracy; the first application should coincide with the inception of the foliar symptoms (circular, white, powdery spots) and one to two repetitions at 10- to 14-day intervals will usually suffice. Satisfactory results were obtained with 100 per cent. sulphur dust (ordinary and Koppers), 75–25 sulphur-lime dust, flotation sulphur spray 1–160, and other sulphur compounds, the dusts being more effective, cheaper, and simpler to handle than the sprays.

MADLE (H.). **Wie kann die Fusskrankheit des Spargels bekämpft werden?** [How can the foot rot of Asparagus be combated?]—*Kranke Pflanze*, xiii, 12, pp. 213–215, 1936.

Measures for the control of foot rot of asparagus (*Fusarium culmorum*) [*R.A.M.*, xiv, p. 735] should include the heating of the manure for the beds to a temperature of 50° to 70° C. to destroy the causal organism on the fragments of straw, wider spacing of new plantings, and the application to diseased stems of a 0·5 per cent. solution of ceresan or uspulun, followed a few days later by the removal and burning of all infected material, with the stumps.

FIKRY (A.). **Powdery mildew of Cucurbitaceae.**—*Bull. Minist. Agric. Egypt* 175, iii+25 pp., 24 pl. (2 col.), 1936.

Powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, xv, p. 667; xvi, p. 13] is one of the most destructive diseases of cucurbits in Egypt, attacking all species except the watermelon, which is only affected in damp localities such as the northern part of the Delta. Crops raised during the autumn and winter are more heavily infected than those grown in the summer and spring, evidently owing to the high humidity of the former period. Temperature is also an important factor. The results of control trials showed that two applications of Bordeaux or Burgundy mixture (1 per cent.), the first when the disease appears and the second three or four weeks later, controlled the mildew completely, but sulphur was equally effective, was the easiest fungicide to use, and gave the greatest increase in yield, sometimes up to ten times that of the controls. The sulphur is put into a two-layer muslin bag attached to a wooden frame with a hole for the insertion of the sulphur, and this 'duster' is shaken over the diseased plants; a third application of fungicide may occasionally be necessary.

RODIGIN (M. N.). О мучнисторосяных грибах на Тыквенных **(Sphaerotheca fuliginea (Schl.) Poll. и Erysiphe cichoracearum Fr.).** [Note on the powdery mildews of cucurbits (*Sphaerotheca fuliginea* (Schl.) Poll. and *Erysiphe cichoracearum* Fr.).]—*Sovetsk. Bot., 1936*, 5, pp. 120–123, 1936.

The author states that careful investigations in 1934 showed the occurrence in the Volga basin of both *Sphaerotheca* [*humuli* var.]

fuliginea [*R.A.M.*, xii, p. 650] and *Erysiphe cichoracearum* [see preceding abstract] on cucurbits. Perithecia of the two fungi occur but rarely in nature, but those of the former species were invariably associated with a light rusty brown efflorescence on the host leaves, and those of the latter with a flour-white efflorescence. These macroscopical characters are considered to be sufficient for the identification of these powdery mildews in the absence of the perithecia.

CAYLEY (DOROTHY M.). **Spores and spore germination in wild and cultivated Mushrooms (Psalliota spp.).**—*Trans. Brit. mycol. Soc.*, xx, 3–4, pp. 225–241, 1 pl., 2 figs., 1936.

The varieties of cultivated mushrooms used in these germination studies were (1) a fuscous variety with 1- to 4-spored basidia, (2) a white, non-fragrant variety with 1- to 5-spored basidia, and (3) a white, fragrant variety with 2-spored basidia. The last-named was met with only once on the English market. Two-spored basidia predominate, but an appreciable percentage of 3-spored basidia occur in types (1) and (2), whereas the wild species *Psalliota campestris* and *P. arvensis* have uniformly 4-spored basidia.

Preliminary experiments showed that the first shed spores of an immature sporophore do not germinate under artificial conditions; to obtain germination the pileus must be fully expanded and the gills umber, and consecutive spore traces from single pilei should be taken at intervals of 12 to 24 hours according to the following method: A flanged lid (from a 4 oz. Country Life tobacco tin) with a rectangular central hole cut in it, is placed after flaming in a 4 in. Petri dish (which it fits), so that the flange rests on the edge of the lower half of the dish, and the hole is immediately above a sterile slide in the dish. A sector from the pileus is placed over the whole and the lid of the Petri dish replaced. The slide with the spore trace is replaced as required. Before storing, the slides should be allowed to dry for 24 hours and then covered with another sterile slide, the two slides fixed together at one end with gummed paper and wrapped in cellophane or paper. Spores remain viable for about 6 months.

To germinate the spores, a hollow-ground slide is placed in a Petri dish on a moist filter paper with a piece cut out to coincide with the hollow. The dish is sterilized, a few drops of Knop's solution are pipetted into the hollow, and a loopful of spores is gently dipped into the liquid, without stirring, so that the spores remain floating on the surface. The dish is then incubated for about 7 days at 26° to 27° C. Small pieces of vigorous mushroom mycelium placed at the edge of the solution 7 to 10 days after sowing stimulate germination. Results are given of spore germination tests by the method described, up to 59·5 per cent. germination being recorded after 14 days. The spores require an incubation period of from six to seven days before they germinate.

In view of the uncertain origin of the cultivated varieties the author regards them merely as cultivated forms of *Psalliota*, though with the exception of the fuscous form, they approach most nearly to *P. campestris*. A description by Miss Wakefield of two forms (white and brown) of cultivated mushroom is appended.

VIDAL (J. L.). **Contre la chlorose de la Vigne.** [Control of chlorosis of the Vine.]—*Rev. Vitic., Paris*, lxxxv, 2212, pp. 400–403, 1936.

The tabulated results of an experiment in 1935, in which badly chlorotic vine-stocks on chalky soil in south-west France had their pruning wounds swabbed in early winter with various chemical solutions, showed that the best control of chlorosis [*R.A.M.*, xv, p. 631] was obtained with 25 per cent. copper sulphate plus 6 per cent. citric acid, which raised the estimated yield in wine in 1936 from an average of 48·3 hl. for the controls to 80 hl.; next in efficacy came 28 per cent. iron citrate, with a yield of 78 hl., while 40 per cent. copper sulphate alone only increased the yield by about 30 per cent. Swabbing with 25 per cent. iron sulphate plus 6 per cent. tartaric acid increased the yield to 77 hl. All these treatments had a markedly beneficial effect on the general health of the vines. The results support the view that chlorosis of the vine on calcareous soils is due to a deficiency of iron.

[A somewhat condensed version of this paper is published in *Progr. agric. vitic.*, cvi, 48, pp. 515–516, 1936.]

BRANAS (J.) & BERNON (G.). **Troisième contribution a l'étude du court-noué de la Vigne.** [Third contribution to the study of court-noué of the Vine.]—*Rev. Vitic., Paris*, lxxxv, 2216, pp. 469–472, 1936.

The results of the tests which are briefly described in this paper showed that during the 1936 season the leaves of vines affected with court-noué [*R.A.M.*, xv, p. 630] had a higher content in glucosides than corresponding leaves from healthy stocks, the difference being nearly always due to a higher content in reducing sugars. The same was also found to be true for the defoliated and decorticated one-year-old shoots of affected stocks during the winter dormant period.

SALMON (E. S.) & WARE (W. M.). **Department of Mycology.**—*J. S.-E. agric. Coll., Wye*, xxxix, pp. 16–24, 1937.

Among many items of interest in this report [cf. *R.A.M.*, xv, p. 424] the following may be mentioned. Ripe perithecia of *Venturia inaequalis* and *V. pirina* were found on overwintered apple and pear leaves, respectively, lying on the ground at Wye, Kent, as early as 14th February, 1936. A strain of *Phytophthora syringae* similar to that described by Ogilvie [ibid., xi, p. 111] was obtained in a pure state from Cox's Orange Pippin apples received on 5th October, 1936, from West Sussex, about 50 per cent. of the whole crop being affected. Apart from a few apples of Blenheim Orange, none of the other varieties was affected in the same orchard. The disease did not appear to pass from fruit to fruit in storage.

Fusicladium crataegi [*F. pirinum* var. *pyracanthae*: ibid., xv, p. 230] was found at Lewes on *Crataegus pyracantha*; the fungus occurs commonly at Wye. *Septoria chrysanthemella* and *S. rubi* [ibid., xii, p. 79] caused leaf spots on chrysanthemum and loganberries, respectively. *Gloeosporium fagicola* attacked the leaves of copper beech, probably the first record of this fungus in England.

Hop downy mildew (*Pseudoperonospora humuli*) [ibid., xv, p. 824] was rather severe, though less damage was caused than in the years of

the worst attacks, 1927, 1930, and 1931. Experience in 1936 showed that four applications of Bordeaux mixture instead of the routine three [ibid., xiii, p. 125] may be advisable in exceptionally wet seasons. Nettlehead [ibid., xv, p. 605] continued to become more prevalent in Fuggles gardens, but the new, apparently resistant varieties, Quality Hop, Fillpocket, and Brewer's Favourite, are expected to prove useful in replanting Fuggles gardens rendered unproductive through the disease. Fluffy tip [loc. cit.] persisted in 1936 on hills affected during the previous season, but there was no evidence of lateral spread; the affected hills were estimated to bear only one-third of the crop of the adjoining healthy ones. Fresh cases of the disease occurred near Canterbury. Hop canker caused by *Fusarium* (*Gibberella*) sp. [ibid., xi, p. 127; xv, p. 462] was unusually prevalent.

VOELKEL (H.) & KLEMM (M.). **Die wichtigsten Krankheiten und Schädigungen an Kulturpflanzen im Jahre 1936. (Beobachtungs- und Meldedienst der Biologischen Reichsanstalt.)** [The most important diseases and injuries of cultivated crops in the year 1936. (Observation and warning service of the Biological Institute).]—*Beil. NachrBl. dtsch. PflSchDienst*, 22 pp., 4 graphs, 56 maps, 1937.

This useful survey of the diseases and injuries affecting cultivated crops in Germany during 1936 has been prepared on the usual lines [*R.A.M.*, xv, p. 425].

POLE EVANS (I. B.). **Pastures and field crops. Annual Report of the Division of Plant Industry.**—*Fmg S. Afr.*, xi, 129, pp. 558–571, 4 figs., 1936.

The following items of phytopathological interest, other than those already noticed from various sources, occur in this report [cf. *R.A.M.*, xv, p. 425]. Mosaic is responsible for very heavy losses in the Transvaal tobacco crop, infection being probably spread mainly by the workers after handling diseased material, since no insect vector has been observed. Leaf curl [ibid., xv, p. 614] has largely disappeared from the Rustenburg tobacco-growing area since the 1932–3 epidemic, but it was present during 1935–6 in certain sections of the Hartebeestpoort irrigation area. Black root rot of tobacco [*Thielaviopsis basicola*: ibid., xvi, p. 348] has recently assumed some importance on black turf soils in the Rustenburg area.

Kromnek [probably identical with spotted wilt] is the most serious disease of tomatoes, causing 60 to 100 per cent. infection in the High- and Middleveld during the period under review. Streak of tomatoes, caused by a mixed infection of potato and tobacco mosaic [ibid., xvi, p. 285], was recently detected for the first time in the eastern Transvaal Lowveld. The Marvel tomato variety is the most resistant to wilt (*Fusarium bulbigenum* var. *lycopersici*) of all those under investigation at Nelspruit [ibid., xiii, p. 548], and should be used as a basis for selection work.

Citrus psorosis [ibid., xv, p. 425] is known to be transmissible from one tree to another, and field evidence denotes that it may be carried in the budwood. The law requires that all infected trees, of which 988

were detected in the Union during the year ended 30th June, 1936, shall be destroyed *in situ*. The results of inoculation experiments on orange stocks have shown conclusively that the disease spreads to the scions and that it cannot be combated by the removal of infected limbs. 'November drop' of oranges reduces the Kat River Valley crop by 20 to 25 per cent. The fruit is shed on reaching a diameter of $\frac{1}{2}$ to $1\frac{1}{4}$ in. Infection by *Alternaria citri* [ibid., xv, p. 716] is suspected, but the fungus has not yet been definitely implicated.

Studies are in progress on the breakdown of stored apples connected with *Penicillium expansum* [ibid., xvi, p. 189]. *Glomerella cingulata* killed the main stems of nursery trees.

Over 60 per cent. of the Uba sugar-cane crop is estimated to be infected by streak [ibid., xv, p. 825], which probably causes an annual loss of over £200,000. Even the most susceptible (Co. 290) of the new commercial canes is highly resistant to the disease in comparison with Uba, contracting under 1 per cent. infection in districts where Uba is a total failure. Certain maize strains derived from Peruvian Yellow are more resistant to streak than other varieties.

Numerous wheat rust (*Puccinia graminis*) samples from the summer rainfall area were found to belong to biologic form 34, to which only 4 and 2 of the 105 varieties tested are resistant and semi-resistant, respectively [ibid., xvi, p. 87].

Stem rot (*Sclerotium rolfsii*) of carnations [ibid., xiii, p. 327] and peanuts [ibid., xv, pp. 278, 325] has been troublesome in the northern Transvaal. Peach rust [*P. pruni-spinosae*: ibid., xvi, p. 279] caused a blemish noticeable in the canned product. Among the new records are a fruit spot (*Septoria* sp.) on *Passiflora quadrangularis*, and anthracnose (*Sphaceloma* sp.) on violets [ibid., xiv, p. 764].

BRIANT (A. K.). **Report on the Agricultural Department, St. Vincent, for the year ended December 31st, 1935.**—42 pp., 1937.

In this report it is stated that the banana acreage in St. Vincent increased from 230 to 550 acres during 1935. Panama disease [*Fusarium oxysporum cubense*] occurred in only three stools in the leeward side of the island, and these were destroyed. To protect slightly infected districts the worst area on the windward side was declared an infected area under the Plant Protection Ordinance, and the removal of banana parts to any other locality prohibited.

MANNS (T. F.), DAVIES (F. R.), HEUBERGER (J. W.), & ADAMS (J. F.). **Department of Plant Pathology.**—*Rep. Del. agric. Exp. Sta., 1935–6* (*Bull.* 205), pp. 37–45, 1936.

The Red June Japanese plum variety (*Prunus salicina*) has been observed regularly to carry more individuals of *Macropsis trimaculata*, the vector of peach yellows and little peach, than any other cultivated plum variety examined [*R.A.M.*, xiv, p. 682; xv, p. 730] and the insects are also stated to be far more prevalent on wild than cultivated plums. In further experiments on the masking of yellows and little peach in plums, 5 Elberta and 5 natural peach seedlings were each budded with two buds from [apparently healthy] plums which had previously been budded with yellows or little peach, or were suspected of being affected,

and it was found that 9 of the plum sources were carrying yellows and 19 little peach, while 3 carried both. Plum buds carrying yellows transmitted infection to 60 and 57 per cent. of the Elberta and natural peach trees, respectively, the corresponding figures for little peach being 20 and 46 per cent.

In comparative tests with different chemical treatments the best control of sweet potato wilt [or stem rot: *Fusarium bulbigenum* var. *batatas* and *F. oxysporum* f. 2: ibid., xv, p. 681] was given by improved semesan bel, though it had a retarding influence on the sett, good results also being obtained with mercuric chloride, Bordeaux mixture (20–20–50), and various copper dusts; McCall's nutrient solution and fungicide 66 [ibid., xv, p. 665] improved the sett.

Complete control of tomato foot rot (*Macrosporium* [*Alternaria*] *solani*) [ibid., xvi, p. 69] in the seed-bed was given by seven sprays with Bordeaux mixture (3–5–50).

An epidemic wilt of watermelons was caused by *F.* [*bulbigenum* var.] *niveum* [ibid., xvi, p. 85] during 1935, all the plants from which the fungus was obtained belonging to the Stone Mountain variety, except one, the infection being apparently introduced on diseased Stone Mountain seed. Plantings were made of a new resistant Stone Mountain variety called 'Long Mountain' obtained from California.

Bacterium pruni was isolated for the first time on 20th September, 1935, from foliage and twig infection of *Prunus pissardi* in an ornamental planting. When an Elberta peach planting previously heavily infected with *Bact. pruni* was sprayed on 15th March 1936 with Bordeaux-oil emulsion (4–4–50 plus 3 per cent. oil), Du Pont spray no. 2, and commercial liquid lime-sulphur (1 in 10), defoliation resulting from foliage infection was severe on the trees sprayed with lime-sulphur, medium for the Du Pont spray, and light for the Bordeaux-oil spray; in another orchard similarly treated the fruit infection amounted to 3·3, 5·4, and 4·3 per cent., for the three treatments, respectively.

Longley (B. J.), Berge (T. O.), Van Lanen (J. M.), & Baldwin (I. L.). **Changes in infective ability of Rhizobia and Phytomonas tumefaciens induced by culturing on media containing glycine.**—Abs. in *J. Bact.*, xxxiii, 1, pp. 29–30, 1937.

The cultivation of either *Rhizobium* spp. or *Phytomonas* [*Bacterium*] *tumefaciens* in media containing concentrations of 0·1 to 0·3 per cent. glycine is stated to result in complete loss of infective capacity after some 30 generations. In the case of *Bact. tumefaciens* similar responses were induced by alanine, glycylglycine, and dicyanamide.

Kaliayeff (A. W.). **Immunité acquise des plantes. Traitement et prophylaxie des tumeurs de Pelargonium zonale provoquées par le Bac. tumefaciens.** [Acquired immunity of plants. Treatment and prophylaxis of tumours of *Pelargonium zonale* induced by *Bacterium tumefaciens*.]—*Bull. Biol. Méd. exp. U.R.S.S.*, i, 5, pp. 387–388, 1936.

Details are given of experiments at the Moscow Institute of Microbiology in the therapeutic treatment of the tumours induced by *Bacterium tumefaciens* in *Pelargonium zonale* [*R.A.M.*, xvi, p. 303] by

repeated injections of (*a*) immune serum from rabbits (1 : 5), (*b*) vaccine prepared from an emulsion of the organism heated at 70° [C.] for an hour and then subjected to alternate freezing and thawing to destroy the bacterial cells, and (*c*) bacteriophage obtained by filtration of a 24-hour-old culture containing 0·25 per cent. sodium chloride. All the methods completely cured the crown gall, the tumours gradually shrivelling and dying in sharp contrast to the continued turgescence of the controls inoculated with pure cultures of *Bact. tumefaciens* and left without further treatment. Normal rabbit serum was much less effective, a slow cure being registered in 5 per cent. only of the test plants.

KRAUS (E. J.), BROWN (NELLIE A.), & HAMNER (K. C.). **Histological reactions of Bean plants to indoleacetic acid.**—*Bot. Gaz.*, xcviii, 2, pp. 370–420, 33 figs., 1937.

In this study it is shown that the histological responses of Red Kidney bean (*Phaseolus vulgaris*) cells to applications of indoleacetic acid in lanoline (30 mg. per gm.) closely resemble those associated with crown gall (*Bacterium tumefaciens*) [*R.A.M.*, xv, p. 782], structures with the same appearance as tumour strands having been produced by the treatment [see next abstract].

SOLACOLU (T.) & CONSTANTINESCO (D.). **Tumeurs à caractères néoplastiques formées sur les plantes par l'action de l'acide β-indolyacétique.** [Tumours with neoplastic characters formed on plants by the action of β-indoleacetic acid.]—*C.R. Acad. Sci., Paris*, cciv, 4, pp. 290–292, 1 fig., 1937.

Previous experiments (*C.R. Acad. Sci., Paris*, cciii, p. 437, 1936) having shown that the application of a dilute solution of β-indoleacetic acid to bean (*Phaseolus vulgaris*) seedlings results in tumour formation [see preceding abstract], similar tests were carried out with the same compound (0·10 per cent. during the first 5 days, 0·20 per cent. thereafter) in glass tubes inserted into *Abutilon avicennae, Ricinus communis*, and *Helianthus annuus*, the area surrounding the site of penetration at the internodes being covered with a thin layer of indoleacetic acid paste. The resultant tumours were neoplastic in character and the cambium contained giant cells.

CHANG-TSI (W.). **Second year's report on the geographic distribution of cereal smuts in China.**—*Spec. Publ. nat. agric. Res. Bur. Minist. Ind., China*, 15, 35 pp., 2 figs., 1 map, 1936. [Chinese, with English summary.]

Most of the information here presented on the geographical distribution of cereal smuts in China has already been noticed from another source [*R.A.M.*, xvi, p. 159].

TAYLOR (E. M.) & HOWATT (J. L.). **Magnesium in field crop production in New Brunswick.**—*Sci. Agric.*, xvii, 5, pp. 294–298, 2 figs., 1937. [French summary.]

In recent years grain crops in the Saint John River Valley area of New Brunswick have turned yellow shortly after coming up, grown

slowly, and produced small yields as a result of low available magnesium. In two out of three fields of oats treated with applications to the soil or to the plants of a spray of magnesium sulphate at rates varying from 60 to 100 lb. per acre, an increased yield was obtained, the treated area in one field yielding 44 bush. per acre, as against only 20 bush. for the untreated area. The same treatment, as a spray, in one instance increased the yield of potatoes [*R.A.M.*, xv, p. 253] by 69 barrels an acre.

KÜDERLING (O. E.). **Untersuchungen über die Feldresistenz einzelner Weizensorten gegen Puccinia glumarum tritici.** [Investigations on the field resistance of individual Wheat varieties to *Puccinia glumarum tritici*.]—*Z. Zücht.*, A, xxi, 1, pp. 1–40, 3 figs., 12 diags., 1936.

A comprehensive, fully tabulated account is given of the writer's investigations on the reaction to six physiologic forms (German and foreign) of *Puccinia glumarum tritici* of a selection of winter and summer wheats [*R.A.M.*, xvi, p. 162] under greenhouse and field conditions.

The results of a series of greenhouse tests in which the plants were (*a*) maintained at constant temperatures of 10°, 15°, 20°, and 15° to 18° C., and (*b*) subjected to alternations (six days at 15° and thenceforth at 25° and vice versa) indicated that, with the latter method, the final temperature is decisive for the extent of rust injury, whereas under the former conditions certain varieties suffer most at the lower temperature range. The various physiologic forms were found to differ in their capacity for infection at low and high temperatures, the Danzig strain, for instance, which is normally most severe on Rouge prolifique barbu and Carsten V in hot weather also being distinctly aggressive at 10° and 15°, while Kitzeberg 31/2 and 32 adapt themselves to the tendency of the particular variety concerned.

The outcome of experiments designed to gauge the reaction of the wheats at various stages of growth to the physiologic forms under observation showed that Ridit and Blé Aurore are highly susceptible only in the seedling stage to Kitzeberg 31/2 and 32 strains but are liable to attack even at maturity by the Langenstein. These two varieties, like Michigan Bronze and Heine II, are practically unaffected by temperature changes. The reactions of Garnet are in general similar to those of Ridit and Blé Aurore, except that it is only moderately susceptible in the seedling stage and is not attacked by the Langenstein strain. At no stage in their development do Hörning's Dickkopf and Normandie show any inherent resistance to yellow rust, the incidence of which in these varieties is almost entirely governed by temperature relations, the latter being absolutely, and the former somewhat, resistant at 10°. Carsten V is subject to severe injury by the Kitzeberg 32 strain at all ages and temperatures, but with advancing maturity it acquires a marked degree of resistance to 31/2, except at high temperatures, while infection by the Langenstein strain is more severe at the lower ranges.

The results of the field experiments, notwithstanding some anomalies, generally confirmed those of the greenhouse trials. Blé Aurore was fairly resistant to the Alnarp [Sweden], Danzig, and Grosny [Caucasus]

strains of the rust, but its reactions to the Kitzeberg forms were not in agreement with those of the greenhouse tests. The Langenstein form showed a remarkable capacity for attacking this variety even as late as July and was in general most aggressive with rising summer temperatures. Marquillo and Garnet were highly resistant to all physiologic forms in the field, and the latter even withstood artificial infection by the virulent Langenstein strain. Heine II, susceptible to all forms in the seedling stage, acquired a certain amount of resistance in the field, especially towards Kitzeberg 31/2. Normandie manifested strong physiological resistance towards all forms of *P. glumarum* except Langenstein, though its tendency (shared to a lesser extent by von Rümker's Sommerdickkopf) to contract infection at low temperatures was expressed in a certain susceptibility to the Alnarp, Danzig, and Grosny strains. Hörning's Dickkopf was susceptible throughout the trials.

Further details are given of the interrelations between the physiologic forms and their hosts at various stages and under diverse environmental conditions, and the paper concludes with a general discussion of the experimental results, in which the author emphasizes the fact that the complex of external and internal factors is responsible for the symptoms manifested. A bibliography of 86 titles is appended.

Straib (W.). **The occurrence and distribution of physiological races of yellow rust.**—*Res. & Progr., Berl.*, iii, 1, pp. 38–42, 1937.

The available information as to the occurrence, distribution, and relative virulence on different hosts of the 38 physiologic forms of yellow rust of wheat (*Puccinia glumarum*) is summarized and briefly discussed. Eighteen of these forms are stated to be of importance in Germany [see preceding abstract] and adjacent countries, form 7 being the most widespread. In the writer's opinion this disease is the most dangerous of all the rusts affecting wheat in western and central Europe, and of recent years in the La Plata States of South America [ibid., xiv, p. 500].

Ralski (E.). **Rozpowszechnienie i rasy biologiczne rdzy brunatnej Pszenicy Puccinia triticina Erikss. w Polsce.** [The distribution and physiologic forms of brown rust of Wheat (*Puccinia triticina* Erikss.) in Poland.]—*Roczn. Nauk rol., Poznań*, xxxviii, 1, pp. 112–133, 1 col. pl., 1 map, 1937. [German summary.]

Brown rust of wheat (*Puccinia triticina*) is stated to be very prevalent and destructive in south Poland [*R.A.M.*, iv, p. 314], where it presumably overwinters in the form of uredo mycelium, no alternate host having been observed. Five physiologic forms of the rust [ibid., xvi, p. 163] have been differentiated, of which XIII and XX are the most prevalent, XXI of common occurrence, and XVIII and XXIV very rare. None of the native winter and summer wheats or of some 300 foreign varieties used in two years' experiments displayed any marked degree of resistance to the Polish forms of *P. triticina*. The only practicable solution of the problem would appear to lie in the development of resistant strains from 28-chromosome and foreign wheats.

Jablokova [Yablokova] (Mme V. A.). Метод витальной окраски при определении жизненности спор и мицелия **Ustilago tritici** *in vitro*. [Determination of the viability of the spores and mycelium of *Ustilago tritici in vitro* by the vital staining method.]—*Pl. Prot. Leningr., 1936,* 11, pp. 68–71, 2 figs., 1936.

The author states that the viability of the mycelium, spores, and chlamydospores of loose smut of wheat (*Ustilago tritici*) can be rapidly determined *in vitro* by staining with 0·003 per cent. neutral red: in living cells the granules are stained red in three to five minutes, while in dead cells the whole protoplasm assumes a diffuse pink colour. The same method was also shown to apply for the differentiation of living or dead cells of *Fusarium buharicum.*

Fellows (H.). **Nitrogen utilization by Ophiobolus graminis.**—*J. agric. Res.*, liii, 10, pp. 765–769, 1936 (issued 1937).

The results of the experiments discussed in this paper showed that in a Czapek's modified nutrient solution, of the 15 inorganic and 35 organic chemical compounds tested, egg albumen, casein, peptone, and nucleic acid alone could be used as sources of nitrogen by *Ophiobolus graminis*, the take-all fungus of wheat. The unavailability of the other substances was not affected by the hydrogen-ion concentration of the medium, by the source of carbon, or by the addition of inorganic or organic growth-promoting materials. The fungus was found to grow well in many plant decoctions, and on the tissues of a number of different plants, the nitrogen consumed probably being derived from protein. It was also shown that a species of *Rhizopus* and one of *Penicillium* were also specific, in certain cases, as to the kind of nitrogen they could utilize, but many more compounds were available to them than to *O. graminis.*

Waldron (L. R.). **Influence of black point disease, seed treatment, and origin of seed on stand and yield of hard red spring Wheat.**—*J. agric. Res.*, liii, 10, pp. 781–788, 1936 (issued 1937).

Comparative field experiments in 1934 in North Dakota showed that plants raised from seed of two wheat varieties (Ceres and a composite lot of three hybrid selections of the F_6 seed of the cross Ceres × (Hope × Florence)) affected with black point, almost entirely caused by *Helminthosporium sativum* and *Alternaria* sp. [*R.A.M.*, xvi, p. 231], did not appreciably differ in yield and other characters, except for a slight variation in seedling stands, from those produced by healthy seed of the same varieties. Treatment before sowing of the diseased seeds with new improved ceresan had no apparent effect either on yield or the other characters of the ensuing crop. Artificial infection of the seed with bunt [*Tilletia foetens*] significantly reduced the yield in every case, the reduction being practically the same in the progeny of the black-pointed as in that of the healthy seed.

Bayles (B. B.). **Influence of environment during maturation on the disease reaction and yield of Wheat and Barley.**—*J. agric. Res.*, liii, 10, pp. 717–748, 6 graphs, 1936 (issued 1937).

A tabulated account is given of experiments in 1930 and 1931, in

which seed of four spring wheat and three spring barley varieties grown during the two preceding years, respectively, at several experimental stations in the United States and Canada were tested for reaction to seedling blight (*Gibberella saubinetii*) in the greenhouse at Madison, Wisconsin, and the wheat varieties for reaction to bunt (*Tilletia levis*) [*T. foetens*] (and also for yield) in the field at Madison, Moccasin (Montana), and Aberdeen (Idaho). The results showed that resistance to seedling blight was affected by the environmental conditions prevailing in the localities where the seed was produced; for wheat the average resistance index varied in 1929 from 45·3 for seed produced at Madison, to 14·8 for that from Mandan, North Dakota, and for barley from 77·6 for seed from Madison to 53·9 for that from Moccasin, Montana. It would seem that seed from some localities may be on the average more resistant over a period of years than seed from other localities, but that in any one year the relative disease reaction of the varieties may be reversed. The differences in reaction to seedling blight were greater between seed of the same variety produced under different environmental conditions than those between varieties from seed produced at the same station. A relationship was found between low protein in the seed and high resistance, and in some cases between large seed and high resistance, but these factors did not account for all differences, the results suggesting that differences of a nutritional or biochemical nature are more important than differences in morphology or size in the embryo and endosperm.

Reaction to bunt was also affected by the environmental conditions under which wheat seed was produced, but to a lesser degree than that to seedling blight; only one of the 76 seed lots tested differed significantly from other seed lots of the same variety. A small correlation (— 0·3036, P = 0·01) was found between size of seed and reaction to bunt, the larger seed producing a lower percentage of bunted plants.

On general lines, these results are considered to emphasize the necessity of carefully selecting seed for testing varietal resistance to disease.

Crosier (W. F.). **Procedure used in an analytical and mycological study of seed Wheat.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1936*, pp. 89–91, 1 fig., 1936.

Among the eight factors for the evaluation of wheat seed the author includes the presence of disease organisms and describes a procedure for determining this factor. From samples of wheat seed 15 gm. portions were removed with a flamed spoon and dropped into flasks of distilled water. While the adhering fungus spores were being loosened from the seeds, the remainder of the samples were sieved and the unbroken bunt balls (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*, respectively], *Fusarium*-discoloured seeds, and ergots [*Claviceps*] were determined per pound of seed. The flasks were then agitated and the aqueous suspensions of the spores present poured into centrifuge tubes. Concentration of the spores was effected by centrifuging at 2100 R.P.M. for three to five minutes and the supernatant liquid was extracted from each until exactly 2 c.c. remained. The concentrates

were then shaken and a drop (0·01 c.c.) was removed with a pipette and placed on a slide for microscopical examination. In a typical sample of wheat seed 27 bunt balls, 2 ergots, and a trace of scabby seeds were present per pound of seed, the number of spores found being as follows: *Alternaria* 97,000, *T. caries* and *T. foetens* 4,550,000, loose smut [*Ustilago tritici*] 575,000, the uredo stage of rust [*Puccinia* spp.] 85,000, and *Fusarium* sp. 239,000.

Biraghi (A.). **Ricerche sulla micoflora radicicola del Grano.** [Researches on the root-inhabiting mycoflora of Wheat.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 147–154, 1 pl., 1936.

An account is given of a preliminary study of the fungi found on the roots of wheat grown in numerous different localities in Italy in soils containing from 5 to 38 per cent. lime and ranging in P_H value from 5 to 8. Of approximately 200 fungi isolated the commonest was *Asterocystis radicis* [*R.A.M.*, xv, p. 751], accompanied by Phycomycetoid mycelia and oospores of Peronosporales, generally in very great abundance. Only in a few instances were any vesicles or any ellipsoidal bodies observed in the cells, resembling those of Peyronel's Phycomycetoid endophyte [ibid., xii, p. 309]. A few Deuteromycetes were noted, including very occasional records of *Fusarium* spp. and members of the Dematiaceae and the Mucedinaceae.

Referring in detail to the first group of cultures (from Mentana wheat grown at Alessandria in alluvial soil containing 14 per cent. lime, and of P_H 7·8), the author states that in addition to *A. radicis* were found three species of Phycomycetes (O1, O4, and O10), two species of *Fusarium*, one species of *Trichoderma*, and two of the Dematiaceae.

The strain O1 showed on the sixth day abundant formation of oogonia usually borne terminally on lateral branches, and measuring 18 to 23 μ in diameter. The antheridial filament averaged 3 μ in diameter, was generally long, sometimes tortuous, and nearly always arose from a different hypha from that bearing the oogonium. The oospore, which did not completely fill the oogonium, measured 16 to 18 μ in diameter, with a wall averaging 1·8 μ thick and sometimes with one or two processes 4 to 12 by 2 to 3 μ, in old cultures. Conidia 20 to 40 (average 30) μ and zoosporangia with reniform zoospores were formed in culture. These characters suggest that the fungus is identical with *Pythium polymorphon* Sideris [ibid., xi, p. 546]. Further investigations are in progress.

Tapke (V. F.). **A method of inoculating seed Barley with black loose smut for use in studies on physiologic races.**—*Phytopathology*, xxvii, 1, pp. 115–116, 1937.

The writer has devised a liquid method of inoculating seed barley with black loose smut (*Ustilago nigra*) [*R.A.M.*, xvi, p. 167] which is stated to obviate certain drawbacks incidental to the dusting procedure. Four diseased heads are immersed in 750 c.c. water in a 1 l. Erlenmeyer flask, which is vigorously shaken to loosen the spores. The spore suspension is transferred to another vessel through a fine screen to remove extraneous matter and poured over small lots of seed in shell vials until the fluid rises about $\frac{3}{4}$ in. above the grain, which is then

vigorously shaken for ½ min. and allowed to soak for 15. The suspension is then decanted and the vials inverted on blotting paper. The vials of moistened, inoculated seed are placed, uncorked, in a moist atmosphere for 24 hours at 18 to 20° C. The seed is finally transferred to small, open envelopes and left until dry enough for sowing. In the autumn of 1935 a field planting of 25 barley varieties was inoculated by this method in North Carolina, and in the following spring, notwithstanding severe winter conditions, a maximum of 83 per cent. infection was registered.

TIDD (J. S.). **Studies concerning the reaction of Barley to two undescribed physiologic races of Barley mildew, Erysiphe graminis hordei Marchal.**—*Phytopathology*, xxvii, 1, pp. 51–67, 2 figs., 1937.

The reactions of 85 barley varieties in the seedling stage to greenhouse inoculation experiments with two new physiologic forms, 6 and 7, of barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, ix, p. 370; xv, p. 568] are described. Heil's Hanna 3 C.I. 682 was added to the list of four differential varieties used in Mains's and Dietz's investigations.

Five wild species of *Hordeum*, viz., *H. murinum*, *H. gussoneanum*, *H. nodosum*, *H. pusillum*, and *H. jubatum*, proved highly resistant to form 6 in winter tests in the greenhouse. Seedling barley plants showed no marked seasonal differences in their reaction to forms 6 and 7 of *E. graminis hordei*, though certain varieties tended to be slightly more resistant in the spring, at which time also adult plants withstand the disease better than seedlings of the same varieties.

Studies of the F_2 and F_3 progeny of three crosses between resistant and susceptible plants indicate that resistance or susceptibility to form 6 of barley mildew in the seedling stage is inherited in definite Mendelian proportions. In all the crosses—Svansota M. 786×Hanna C.I. 906, Featherston C.I. 1118×Goldfire C.I. 928, and Arequipa C.I. 1256×Horsford C.I. 610—a single pair of factors is involved, but in the two first resistance is only partially dominant while in the third it is completely so.

STAKMAN (E. C.). **Variation in Ustilago zeae.**—*Science*, N.S., lxxxv, 2193, pp. 58–59, 1937.

The author states that the maize smut *Ustilago zeae* comprises an indefinite number of strains or lines, and in his and his collaborators' studies [*R.A.M.*, xiii, p. 226] the fungus proved to be especially suitable for investigations on heritable variations, because of the constancy of the vegetatively propagated unicellular, unisexual individuals on nutrient media, giving rise to unisexual lines, within which all the individuals, barring mutations, have the same heritable properties. Innumerable new lines, however, may be produced either by mutation in the original lines or by hybridization between two unisexual lines. As demonstrated by extensive studies, the new lines differ from one another in one or more characters, such as type of growth, colour, size, and topography of the colonies, sex and parasitism, and tendency to mutate. Several hundred mutant lines were studied and though some were found to be conspicuously different from each other, others differed in almost imperceptible but distinctive characters. It was

shown that the factors for the new mutant characters are inherited when mutant lines are crossed with lines of opposite sex, and the tendency to mutate is due to heritable factors and differs greatly in different lines. Segregates from crosses between mutable and constant lines were either very mutable, moderately mutable, or constant, and by crossing the most mutable lines with one another for several generations, material was obtained in which all segregates are extremely mutable. [The subject matter of this note was discussed in some detail in the author's recent publication already briefly noticed: ibid., xvi, p. 48].

SASS (J. E.). **Histological and cytological studies of ethyl mercury phosphate poisoning in Corn seedlings.**—*Phytopathology*, xxvii, 1, pp. 95–99, 2 figs., 1937.

An anatomical study was made of the hypertrophy induced in yellow dent maize seedlings by 24 hours' immersion in 1 in 1,500 new improved ceresan (ethyl mercury phosphate) [*R.A.M.*, xvi, p. 162]. The leaf primordia undergo extensive thickening and develop irregular crenations and lobes, and both in these organs and in the apical meristem of the plumule cell division is inhibited and extreme enlargement of the existing cells takes place [cf. ibid., xiii, p. 624]. The cells of the hypertrophied organs become multinucleate, containing nuclei ranging from minute 'micronuclei' to polyploid 'giant nuclei' the number of chromosomes in which may exceed 200.

VAHEEDUDDIN (S.). **Observations and experiments on diseases of plants in Hyderabad State, India.**—*Proc. Minn. Acad. Sci.*, iv (*1937*), pp. 47–50, 1 fig., 1937.

Following some observations on certain diseases of important crops in Hyderabad State, India, with special reference to the sorghum smuts caused by *Sphacelotheca sorghi*, *S. cruenta*, and *Sorosporium relianum*, the writer describes experiments conducted at St. Paul, Minnesota, to determine the possibility of hybridization between the two last-named species [*R.A.M.*, xiv, p. 504]. Monosporidial lines of each of the smuts, isolated from the promycelia of germinating chlamydospores, were cultured for a week on potato dextrose broth and five were injected hypodermically, both singly and in paired combinations, into five-week-old sorghum seedlings. None of the single lines caused infection, but foliar chlorosis was induced in 8 to 12 days by 11 out of 18 of the pairs. Long sori developed in the inflorescences of the diseased plants. The hybrid chlamydospores are echinulate like those of *S. reilianum* and intermediate in size (8·8 μ) between the two parents. The promycelia and sporidia are significantly larger (79 and 12·7 μ in length, respectively) than those of either parent. Monosporidial lines isolated from the hybrid chlamydospores and inoculated singly and in different paired combinations into sorghum plants produced foliar chlorosis and sori in the inflorescences. Back-cross trials of the hybrid with both parental lines showed the former to be capable of uniting with either of the latter and infecting the host. This intergeneric hybrid gave evidence of the vigour normally associated with crosses among higher plants, and it is thought that many new smut types and physiologic forms owe their inception to spontaneous hybridization in nature.

POWELL (H. C.) & MATHEWS (I.). **The use of zinc sulfate in controlling mottle leaf of Citrus trees.**—[*Publ.*] *Univ. Pretoria*, Ser. i, 35, 4 pp., 1936. [Abs. in *Chem. Abstr.*, xxxi, 3, p. 199, 1937.]

In this further account of the control of citrus mottle leaf [*R.A.M.*, xiv, p. 753; xvi, p. 93] in the Sundays River Valley, Pretoria, it is stated that the application to the soil round bearing trees of 8 lb. zinc sulphate gave good results but in some cases caused damage to the trees. Spraying with zinc sulphate and hydrated lime (10–5–100) with 8 to 10 oz. spreader restored diseased trees to a normal state of health and vigour in a few months, but the trees should not be sprayed less than two months before picking, since the compound leaves a temporary white residue on the fruit that resists washing or brushing. The beneficial effects of the zinc sulphate treatment appear to persist for at least two years. Mottle leaf of grapefruit was combated by treatment with a mixture of 3·33 lb. zinc oxide and 100 galls. water, but some burning of the young fruit occurred.

NYENHUIS (E. M.). **Attempts to control Citrus concentric ring blotch.**—*Fmg S. Afr.*, xi, 127, p. 424, 1936.

Negative results in the control of concentric ring blotch on Bailedge Early Orange nursery trees budded on rough lemon stocks [*R.A.M.*, xiv, p. 679] were given by spraying with 0·4 per cent. solutions of iron, calcium, copper, manganese, magnesium, potassium, ammonium, and zinc sulphates and superphosphate.

FRITZ (A.). **Les taches des grains de Café.** [The spots of Coffee beans.]—*Ann. agric. Afr. occ.*, i, 1, pp. 99–109, 1937.

In San Salvador [Central America] coffee cherries are liable to infection by *Omphalia flavida* [*R.A.M.*, xvi, p. 314] at all stages of growth, but particularly until they reach two-thirds of their full size, since the mature tissues are insufficiently acid (P_H 7·3 to 7·5) to favour the fungus, which grows best at P_H 4·8 to 5. Affected young fruits at once turn black, but generally remain attached to the trees. The chief losses are sustained when the fruits are 4 to 5 months old; when these are attacked they become a total loss, the fungus causing the fruits to wither up, and to turn livid yellow, streaked with pink, then light brown, gradually darkening. Whether these fruits fall or not, they constitute serious infection centres. Only one or two spots are present on the outside of each fruit; often one is 6 to 8 mm. and the other 1 to 2 mm. in diameter. The spots are well-defined and slightly depressed, and the affected tissues often crack and fall. On ripening fruits the fungus develops more slowly, most of the fruits reaching maturity without wrinkling or spotting, and in some cases appearing quite normal.

After depulping berries may show spots of the same shape and size as those seen on the fruits. Some of the berries from obviously infected fruits appear to be normal, but are not so, and the disease continues to develop right up to the time they are placed on sale. After processing the berries may show brown to black or bluish spots.

Brown eye spot (*Cercospora coffeicola*) [loc. cit.] may be present on the fruits as round spots 2 to 3 mm. in diameter, principally near the apex; these may enlarge, reaching 10 mm. in diameter, or they may

be irregular, rectilinear, and confluent. Affected fruits rapidly wither, at least on one side, and show the presence of black blotches. Green fruits are those most liable to attack. The berries show white or blue spots.

ROGER (L.). **La rouille du Caféier au Cameroun (Hemileia coffeicola Maublanc et Roger).** [Coffee rust in the Cameroons (*Hemileia coffeicola* Maublanc & Roger).]—*Ann. agric. Afr. occ.*, i, 1, pp. 92–98, 1 pl., 5 figs., 1937.

In this full account of the coffee rust recently reported from the Cameroons as due to *Hemileia coffeicola* [*R.A.M.*, xiv, p. 303] the following points may be noted. The upper surfaces of diseased leaves long remain green, before finally yellowing, though a few leaves dry up and turn brown at once. The branches near the ground are those most affected and in serious outbreaks complete defoliation may occur.

The mycelium in the leaf is characterized by the large diameter of the hyphae which swell as they pass from the mesophyll towards the substomatal chamber, the diameter increasing from 6 to 8 μ up to 30 μ. The haustoria are localized chiefly in the upper mesophyll and occur as voluminous, irregularly lobate masses, almost completely filling the cell.

The areas at present infected are either unfavourable to the cultivation of *Coffea arabica* or have an excessively long wet season, this period always coinciding with a recrudescence of the disease, which is favoured by over-luxuriant foliage, maintaining an excessive humidity, over-production, weakening the trees, and high soil and atmospheric humidity. Control consists in adequate pruning, pinching off the flowers in cases of over-production, and spraying during the rainy season with freshly made neutral, casein Bordeaux mixture applied preventively at a strength of 1·5 per cent. at the end of the dry season and once or twice later on at a strength of 2 per cent. The disease has been found at Dschang, Foumban, and Abong M'Bang, its presence in the last-named locality indicating a very extensive and alarming spread eastwards.

CASTELLANI (E.). **La ruggine del Caffè (Hemileia vastatrix B. e Br.).** [Coffee rust (*Hemileia vastatrix* B. et Br.).]—*Agricoltura colon.*, xxxi, 1, pp. 15–23; 2, pp. 66–72, figs., 1937.

After pointing out that coffee rust (*Hemileia vastatrix*) [*R.A.M.*, xvi, p. 154] has not yet been reported from Italian East Africa, the author gives a semi-popular account based on a study of the literature of the geographical distribution, symptoms, morphology, predisposing conditions, and control of the disease.

DJELALOFF (R.). Результаты опытов по гоммозу Хлопчатника в Сабир-Абадском районе АССР. [Results of experiments on gummosis of Cotton in the Sabir-Abad region of Azerbaijan.]—*Publ. Азербайдж. научно-исслед. Хлопков. Инст. АзНИХИ* [*Azerbaijan Cotton sci. Res. Inst. AzNIKhI*], Kirovabad, Sci. Ser., 14, 33 pp., 2 diags., 5 graphs, 1936. [English summary.]

A very fully tabulated account is given of experiments in 1934 in

Azerbaijan [Transcaucasia] on the control of *Bacterium malvacearum* on cotton [*R.A.M.*, xvi, p. 249]. Steeping non-delinted cotton seed for 5 minutes in 1 in 100 formalin and covering it with tarpaulins for two hours reduced the incidence of the black arm symptoms from 27·0 per cent. in the control to 15·5 per cent., compared with 22·1 per cent. for treatment with sulphuric acid (1·7 to 1·8 sp.g. for 15 min.), and the incidence of angular leaf symptoms from 26·3 to 18·1 and 21·1 per cent., respectively, the corresponding index figures for intensity of infection (scale 0, 0·1, 1, 2, 3, and 4) being 7·3, 3·3, 5·5, 2·7, 1·5, and 1·4, respectively. Sulphuric acid treatment accelerated somewhat the germination of the cotton seed and apparently stimulated the vigour of the young seedlings, but this effect wore off as the season advanced.

Field observations showed that infection with *Bact. malvacearum* was greater on soils sown to cotton for three consecutive years, indicating that the organism survives the winter under local conditions. In plots sown on 22nd March the incidence of black arm was 26·6 per cent. and of angular leaf spot 10·8 per cent., as against 55·2 and 36·8 per cent., respectively, in plots sown from the middle of April onwards. The intensity of black arm was shown to be directly related to the severity of the crop losses, the actual figures given being 7·7 per cent. total loss in plants with lesions not girdling the stems, 31·5 per cent. in plants with lesions girdling the stems, 53·3 in plants with stunted or deformed stems, and 82·6 per cent. in plants with entirely or partly broken but still living stems.

Krug (H. P.). **Segunda contribuição para a distribuição geographica da murcha do Algodeiro (Fusarium vasinfectum) no Brasil.** [Second contribution to the geographical distribution of Cotton wilt (*Fusarium vasinfectum*) in Brazil.]—*Circ. Inst. agron. Campinas* 5, 2 pp., 1937. [English summary.]

Fusarium vasinfectum was first recognized in Brazil on cotton from the Textile Plant Experiment Station, Alagoinha, Parahyba, and reported to a meeting of Brazilian phytopathologists in January, 1936. In December of the same year the fungus was isolated in pure culture from plants growing near Recife, Pernambuco, and its pathogenicity established by inoculation experiments. It is suspected that the organism is present in most of the cotton-growing regions of north-eastern Brazil.

Léger (L.) & Gauthier (Marcelle). **Graminella bulbosa nouveau genre d'entophyte parasite des larves d'Ephémérides du genre Bactis.** [*Graminella bulbosa*, a new genus of entophyte parasitic on the larvae of Ephemeridae of the genus *Bactis*.]—*C.R. Acad. Sci., Paris*, cciv, 1, pp. 27–29, 5 figs., 1937.

Graminella bulbosa n.g., n.sp., found parasitizing *Bactis rhodani* larvae, to the rectal cuticle of which it is attached by means of bulbous 'feet', in streams in the vicinity of Grenoble, is a member of the Harpellaceae [cf. *R.A.M.*, xv, p. 649]. It is characterized by a main axis, 500 to 600 μ long, from which proceed erect branches terminating in a few slender 'ears', 100 to 120 μ in length, of up to 20 densely aggregated unilateral, ovoid, elongated spores, 12 to 15 by 3 μ, furnished

with a single caudal appendage up to 70 μ in length. Reproduction is effected by means of budding from the basal cells. There may be as many as 30 or 40 of these 'arbuscles' attached to a single host, the whole presenting the aspect of minute wheat sheaves with the ripe ears turned outwards.

WITTICH (F. W.) & STAKMAN (E. C.). **Case of respiratory allergy due to inhalation of grain smuts.**—*J. Allergy*, viii, 2, pp. 189–193, 2 figs., 1937.

The sputum of a 48-year-old man working in the milling district of Minneapolis and suffering for over 20 years from asthma was found to contain spores of *Ustilago zeae*, of a smooth-spored species of *Ustilago*, and of *Tilletia levis* [*T. foetens*], and he reacted positively to scratch and puncture tests with extracts of *T. tritici* [*T. caries*], *T. foetens*, *U. tritici*, *U. hordei*, *U. nuda*, *U. avenae*, *U. crameri*, *U. zeae*, *Urocystis occulta*, *Sphacelotheca sorghi*, *S. cruenta*, and *P. graminis tritici* [*R.A.M.*, xii, p. 174], the most pronounced effects being due to *T. caries*, *T. foetens*, *Ustilago zeae*, and *S. sorghi*.

It would appear from these and other observations in cereal-growing areas that smuts may be equally important with the commoner moulds in the etiology of respiratory allergy and frequently augment the susceptibility of grain-sensitive patients. During the last few years, periods of drought, low humidity, and high winds have combined to render the spore content of the air abnormally high. During the rust epidemic of 1935, for instance [ibid., xvi, p. 25], as many as 980,000 per sq. ft. were deposited a few feet above the ground during a 24-hour period, and the number sometimes reached 1,000,000.

MARTIN (D. S.), JONES (C. P.), YAO (K. F.), & LEE (L. R.). **Classification of the genus Monilia.**—Abs. in *J. Bact.*, xxxiii, 1, pp. 28–29, 1937.

Over 150 strains of *Monilia* [*Candida*] [*R.A.M.*, xvi, p. 177] from human sources were studied in comparison with strains supplied by [Rhoda W.] Benham, Stovall, Langeron, Castellani, and others. Colony formation on blood agar, growth type on glucose broth, carbohydrate fermentation, microscopic morphology on maize meal agar, and serological properties were sufficiently clearly correlated to classify the fungi under observation into six well-defined groups. Consistent results with sugar fermentations were obtainable only after a given organism had been passed through several generations on sugar-free media. It was further found essential to cover the inoculated carbohydrate broth with a vaseline seal. Agglutinations with immune sera were of some value in confirming the separation of these fungi into groups, but the antigenic relationships are so close as to preclude the use of this method for diagnostic procedure.

PINKERTON (ELIZABETH). **Dissociation in Monilia.**—Abs. in *J. Bact.*, xxxiii, 1, p. 117, 1937.

Comparative morphological studies were conducted on 50 strains of *Monilia* [*Candida*] from various pathological conditions in human patients [see preceding and next abstracts], and on the basis of giant

colony formation, six types were recognized which appeared to agree fairly well in other characters. Representatives of the four main types were carried through several generations by means of loop transfers. The giant colony characters varied noticeably in most cases, though a few stable strains were encountered. In one variable strain followed through four generations, all the progeny were segregated into four sub-types consisting of one main group around which the others varied with a normal curve distribution. In the same strain plate colonies were examined after 48 hours for S, R, and r varieties, of which the first were common and unstable, the second infrequent and stable, and the third intermediate in both respects. All three types were secured from single giant colonies in some cases.

SCHWARTING (VIRGINIA). **Occurrence of Monilias in tuberculosis sputum.**—Abs. in *J. Bact.*, xxxiii, 1, p. 117, 1937.

Strains of *Monilia* [*Candida*: see preceding and next abstracts] were isolated from 19·6 per cent. of the sputa of tuberculous patients [cf. *R.A.M.*, xvi, p. 254] in a series of 500 cultures. Of the total number of strains secured, 65·3 per cent. originated in persons with advanced lesions, 24 per cent. from moderately severe cases, and only 10 per cent. from mildly affected patients, while in a series of 100 up-grade individuals only 7 were positive for the presence of *Candida* in the sputum. It is thus apparent that the extent of tuberculosis in the lungs influences the incidence of fungal infection in the sputum, though the manner in which the connexion operates is not entirely clear. Less than half (about 43·4 per cent.) the strains in a series of 23 studied were pathogenic to mice.

TODD (RAMONA L.). **Studies on yeast-like organisms isolated from the mouths and throats of normal persons.**—*J. Bact.*, xxxiii, 1, pp. 117–118, 1937.

Of 1,000 normal persons examined for the mycological flora of the mouth and throat at the Minnesota Department of Health, 14·7 per cent. harboured yeast-like fungi and in 14 per cent. *Monilia* [*Candida*] *albicans* was present [see preceding abstracts]. In 7 per cent. the fungus occurred in both mouth and throat, in 3·1 per cent. in the mouth only, and in 3·9 per cent. in the throat only. The incidence of the fungus was higher in females (18·2 per cent. of 527) than in males (9·3 per cent. of 473).

In tests with human sera, agglutinins of *C. albicans* were found to be present in the sera of 30·4 per cent. of 533 females and in those of 15·7 per cent. of 617 males. Some relationship would thus appear to be indicated between a high titre of agglutinins in the serum and the presence of *C. albicans* in the mouth and throat of a given individual. [An expanded account of this work is given in *Amer. J. Hyg.*, xxv, 2, pp. 212–220, 1937.]

CATANEI (A.) & HIGOUMENAKIS (G.). **Sur les teignes humaines observées en Grèce.** [On the human ringworms observed in Greece.]—*Bull. Soc. Path. exot.*, xxx, 1, pp. 6–8, 1937.

Twenty-two cases of trichophytosis of the scalp examined at Athens

in the course of the first systematic study of Greek dermatomycoses yielded 18 pure cultures of *Trichophyton*, viz., 15 of *T. violaceum* [*R.A.M.*, xvi, p. 317], 2 with smooth colonies (one new species and a new variety of *T. glabrum* to be described in a forthcoming paper), and 1 of *T. plicatile* [ibid., xv, p. 218]. Eleven of the 12 cultures obtained from 13 cases of microsporosis of the scalp were identified as *Microsporon canis* (*M. felineum*) [ibid., xvi, p. 317] while one approximated to *M. equinum* [ibid., xv, p. 580]. From 14 cutaneous lesions 7 cultures were obtained, 4 of *M. felineum* and 3 of *T. violaceum*.

De Cisneros (J. M. G. J.). **El cultivo de los dermatomycetos sobre medios naturales, vegetales y animales.** [The cultivation of the dermatomycetes on natural vegetable and animal media.]—*Med. Países cálidos*, ix, 1, pp. 1–15; 2, pp. 49–74, 10 figs., 1936.

Wheat or oat grains, and wheat flour, starch, and dextrin agar constituted less suitable media for 15 strains of dermatophytes used in the author's studies than the standard nutrient substrata [cf. *R.A.M.*, xv, p. 721]. Twenty species of *Epidermophyton*, *Microsporon*, *Achorion*, and *Trichophyton*, however, made excellent growth on human or animal (sheep) cerebral pulp, which retarded pleomorphism in the initial stages but was powerless to restore the original characters in cases where this process had reached an advanced phase.

Schmidt (P. W.) & Marquardt (U.). **Ueber den antimykotischen Effekt ätherischer Öle von Lauchgewächsen und Kreuzblütlern auf pathogene Hautpilze.** [On the antimycotic effect of the volatile oils of Alliaceae and Cruciferae on pathogenic skin fungi.] —*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxviii, 1–2, pp. 104–128, 9 figs., 1936.

A detailed, tabulated account is given of experimental observations on the action on cultures of *Epidermophyton* [*Trichophyton*] *interdigitale*, a very important agent of human mycoses [*R.A.M.*, xvi, p. 253] in Germany, of pharmaceutical preparations of garlic, onion, and horseradish and extracts thereof, all of which retarded or inhibited the development of the fungus grown on Grütz's agar, owing to their minute content of volatile oils. The possible therapeutic applications of these drugs in cases of epidermal infection are briefly discussed.

Lochte (T.). **Über das Vorkommen der Piedra beim Schimpansen und über die Beziehungen der tierischen Piedra zur menschlichen.** [On the occurrence of piedra in the Chimpanzee and on the relations of animal to human piedra.]—*Arch. Derm. Syph., Berl.*, lxxv, 1, pp. 107–113, 7 figs., 1937.

A species of *Trichosporon*, probably *T. hortai* or *T. beigeli* [*R.A.M.*, xii, p. 444; xv, p. 20], characterized by mosaic-like cells, 3 to 6 μ in diameter, and asci (sporocysts) up to 32 μ in diameter, containing fusiform, slightly curved ascospores, was isolated from the hair of a young chimpanzee in the Munich zoological collection, and subsequently from six skins, all the material originating in the Cameroons. *T. hortai* is stated to be innocuous to human hair, whereas that of the chimpanzees was extensively disorganized by the *Trichosporon* under observation.

KAMBAYASHI (T.) & OTAKE (S.). **Über die Tierpathogenität pflanzenpathogener Pilze, insbesondere von Fusarium solani (Mart. pr. p.) App. et Wr.** [On the pathogenicity to animals of plant-pathogenic fungi, especially of *Fusarium solani* (Mart. pr. p.) App. & Wr.]—*Z. Parasitenk.*, viii, 5, pp. 611–616, 3 figs., 1936.

The cutaneous inoculation of *Fusarium solani* from onion [*R.A.M.*, xii, p. 135], *F. bulbigenum* var. *niveum* from watermelon [see above, p. 369], and *Gibberella fujikuroi* [ibid., xv, p. 173] and *G. saubinetii* from rice [ibid., xiv, p. 653] into guinea-pigs resulted in the development of erythema, pustule formation, and scaling, the symptoms being most severe in the case of the first-named and of very slight intensity in that of *G. fujikuroi*; all the fungi were reisolated from the sites of infection. The two species of *Fusarium* were further inoculated into the writers' arms with positive results, which were again more severe in the case of *F. solani*, and successfully reisolated.

BAKER (R. D.) & BRIAN (E. W.). **Blastomycosis of the heart.**—*Amer. J. Path.*, xiii, 1, pp. 139–147, 1937.

Blastomycosis of the heart was encountered at the autopsies of two cases (young negroes) of generalized infection with *Blastomyces* [*Endomyces*] *dermatitidis* [*R.A.M.*, xvi, p. 254]. Each showed diffuse pericardial blastomycosis, a large blastomycotic tubercle of the right atrial wall, and involvement of the corresponding endocardium, whence the organisms apparently entered the blood stream to produce the miliary pulmonary blastomycosis noted in both instances.

TAKAHASHI (Y.). **Zur Chromoblastomykose. (I. Mitteilung.) Über Chromoblastomykose, verursacht durch Torula poikilospora n.sp.** [First note on chromoblastomycosis. On chromoblastomycosis caused by *Torula poikilospora* n.sp.]—*Jap. J. Derm. Urol.*, xli, 1, pp. 31–43, 9 figs., 1937.

To the three known agents of chromoblastomycosis, namely, *Trichosporium* (*Acrotheca*) *pedrosoi*, *Phialophora verrucosa*, and *Hormiscium dermatitidis* [*R.A.M.*, xv, p. 502; xvi, p. 251], the writer adds a fourth, *Torula poikilospora* n.sp., responsible for an ulcerated condition of the left leg [the clinical aspects of which are fully described] in a 58-year-old Japanese peasant.

The fungus is characterized by olive-green hyphae, 1·5 to 4·5 μ in width, bearing laterally and terminally long, branched chains of very irregular, olive-green spores, 2 to 25 by 1·5 to 16 μ, together with normal spherical (2 to 9 μ), ellipsoid or oval (2·5 to 14 by 1·5 to 8 μ) elements. The spore chains consist mainly of arthrospores interspersed with budding forms; they do not readily fall apart. Double-walled, light brown to brownish-black chlamydospores develop in older cultures.

T. poikilospora made slow growth on Sabouraud's glucose agar and other media, forming greenish-black, compact colonies, with radial grooves extending from the raised centre to the periphery; the surface is covered with a brownish-grey down. The optimum temperature for growth is 37° C. Sugars were not fermented. The fungus was inoculated with positive results into the patient and laboratory animals.

TECCE (R.). **À propos d'un blastomycète (Cryptococcus uvae Pollacci et Nannizzi) isolé d'après la langue de l'homme.** [On a Blastomycete (*Cryptococcus uvae* Pollacci & Nannizzi) isolated from a human tongue.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 12, pp. 256–257, 1936.

A fungus isolated in a case of acute glossitis from a human tongue and stated by Pollacci to have the characters of *Cryptococcus uvae* [*R.A.M.*, x, p. 256] made vigorous growth in pure culture after 24 hours at 37° C. on Sabouraud's agar, the white, smooth, shining colonies measuring 1 to 2 mm. in diameter, and after 10 to 15 days developing indentations which became progressively more marked. The blastospores were round (2 to 7 μ in diameter) or oval (9 by 4 μ), had a double wall, and frequently budded. On potato the hyphae consisted of 2 to 3 segments, averaged 2 μ in diameter, and bore large aggregations of blastospores at their extremities. Unlike Gandini's strain [loc. cit.] the author's developed very poorly on plain agar, slowly on glycerine agar, and vigorously on Sabouraud glucose. In plain bouillon no superficial pellicle formed, though present on glycerine bouillon. The organism did not liquefy gelatine, coagulate milk, or ferment lactose, maltose, dulcite, or mannite, but fermented glucose, levulose, saccharose, and galactose. It was pathogenic to the rat, from the peritoneal fluid of which it was reisolated.

CIFERRI (R.) & REDAELLI (P.). **Sur la probable situation systématique de Bargellinia monospora Borzì.** [On the probable systematic position of *Bargellinia monospora* Borzì.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 12, pp. 260–263, 1936.

In discussing the systematic position of *Bargellinia monospora* isolated by Borzì in 1888 at Messina from cerumen, the authors state that Borzì's description of the fungus, assuming that the so-called ascus is a non-sexual form of reproduction, fits in exactly with their own description of *Sporendonema epizoum* [*R.A.M.*, xv, p. 580]. Furthermore, the description of the reproductive organs of *B. monospora* greatly resembles Vuillemin's description of the hemispores of *Hemispora stellata* [ibid., xv, p. 20], in the sense that Borzì's 'clubs', which are at first continuous, then septate, and finally differentiated into globose, brownish, verrucose spores, correspond to Vuillemin's ampulliform, vesiculous protoconidia; the latter must become septate to form the deuteroconidium, which finally becomes individualized into 'spherical, dark, verrucose hemispores'. This identification is confirmed indirectly by the fact that *S. epizoum* has been found several times in organic substrata or in air in Sicily. Further proof is that *S. epizoum* was first recorded (under the name *Torula rufescens* Fresenius) in a case of otitis in Germany in 1870 and was later isolated from another case of otitis by Ciferri in the Dominican Republic.

It is concluded that *B. monospora* is identical with *H. stellata*, *T. d'agatae* [ibid., xiii, p. 701], and *S. epizoum*.

JONES (P. M.). **A new species of Microascus with a Scopulariopsis stage.**—*Mycologia*, xxviii, 6, pp. 503–509, 24 figs., 1936.

The author describes the cultural and cytological characters of a

fungus isolated in December, 1931, from an infection of the hands and forearm. On Sabouraud's media the growth was smooth and whitish, becoming greyish-mealy with the formation of conidia and turning black with the development of ascocarps; the growth also became wrinkled and raised above the surface of the agar. The perithecia developed abundantly in Knop's solution on slides; and the author has found this solution more satisfactory for dermatophytes than agar media. The conidial stage is regarded as a new species of *Scopulariopsis* which is named *S. lunaspora*, and the perithecial stage as a new species of *Microascus*, differing from *M. trigonosporus* and *M. sordidus* in its lunate spores, and is named *M. lunasporus* [both with diagnoses in English]. *S. lunaspora* is characterized by oval to lemon-shaped conidia with a collar at the base and measuring 4 to 7 by 2 to 4 μ, borne in chains directly on the mycelium, or on simple or branched conidiophores with sterigmata 5 to 12 μ long. The perithecial stage, *M. lunasporus*, is beaked with a papillate ostiole, carbonaceous, and 175 to 300 μ in diameter; the 8-spored, oval, deliquescent asci, 7 to 14 by 7 to 12 μ, are irregularly distributed and the lunate ascospores, 8 to 14 by 4 to 7 μ, are extruded in light reddish-brown cirrhi.

Calinisan (M. R.) & Hernandez (C. C.). **Studies on the control of Abacá bunchy-top with reference to varietal resistance.**—*Philipp. J. Agric.*, vii, 4, pp. 393–408, 3 pl., 1 fig., 1936 (issued 1937).

Further studies in Cavite, Philippine Islands, on the selection and propagation of abacá [*Musa textilis*] varieties highly resistant to bunchy top [*R.A.M.*, xv, p. 80] and on roguing as a means of control showed that a possibility exists of rehabilitating the industry by planting the introduced Putian variety, which six years' observations and inoculation experiments have shown to be highly resistant. The relative resistance of the local Sinibuyas and Kinalabao varieties that survived the disease was not permanent, but these varieties may be planted where the disease has disappeared, if the suckers or rootstocks are healthy and taken from healthy stools, and provided the plantations are regularly inspected. Constant roguing and burning of diseased plants and replanting with healthy ones gave very satisfactory results at Silang experiment station.

Bolsunova (Mme O.) Влияние различной зараженности семян Льна антракнозом на проявление и развитие болезни в посевах. [Effect of varying degrees of infection of Flax seed with anthracnose on the incidence and development of the disease in the crop.]—*Pl. Prot. Leningr.*, *1936*, 11, pp. 58–67, 4 graphs, 1936. [English summary.]

After briefly referring to the very great economic importance of flax anthracnose (*Colletotrichum lini*) [*R.A.M.*, xv, p. 369] in the U.S.S.R., the author concisely describes a rapid method devised for the determination of the degree of infection of linseed with the fungus, in which each seed is separately incubated in a drop of water at 20° to 22° C. for 24 or, if necessary, 48 hours, after which time the fungus is easily detected under a low power microscope. It was shown that heavily infected seeds, thoroughly permeated by the mycelium, do not germinate at all. The results of two consecutive years' field tests

showed that sowing linseed with over 15 per cent. infection results in considerably thinned out stands and very uneven growth of the plants, the number of stunted stems proportionately increasing with the degree of infection of the seed. Observations during the two years also indicated that secondary infection rapidly spreads in the field, and in view of this fact it is provisionally recommended that linseed be not used for sowing if it contains 10 per cent. infection or over.

FIKRY (A.). **Egypt: appearance of Antirrhinum rust in the country.**—*Int. Bull. Pl. Prot.*, xi, 1, p. 1, 1937.

In November, 1936, antirrhinum rust (*Puccinia antirrhini*) suddenly appeared on a wide range of commercial varieties near Cairo, this being the first record of the disease in Egypt [*R.A.M.*, xvi, p. 256]. Early sown plants were attacked with particular severity, presenting a scorched aspect and mostly being killed outright. The spread of this disease from America to Bermuda and Europe is briefly traced.

YARWOOD (C. E.). **Physiologic races of Snapdragon rust.**—*Phytopathology*, xxvii, 1, pp. 113–115, 1 fig., 1937.

Excised snapdragon [*Antirrhinum majus*] leaves in a 5 per cent. sucrose solution in Petri dishes were inoculated with two groups of rust (*Puccinia antirrhini*) [see preceding abstract] collections, one from resistant plants grown in several localities of California, where normally rust-resistant varieties were heavily infected in certain coastal regions in 1936, and the other from susceptible individuals at Berkeley, where resistant plants remained free from the disease. The leaves of susceptible plants contracted heavy infection from all the collections, whereas those of resistant plants were attacked only by that from resistant individuals. Resistant snapdragons remained immune from the Berkeley collection in five tests, and from the Davis and Sacramento strains in one. The susceptibility of resistant plants to the rust from five other coastal districts in the State was demonstrated in five experiments. These data are considered to prove the existence of at least two physiologic forms of *P. antirrhini*, that to which the resistant plants are resistant being designated 1, and that attacking the resistant selections 2. Of 11 tested plants of different genetic lines of resistant snapdragons, none gave evidence of resistance to form 2.

FREITAG (J. H.) & SEVERIN (H. H. P.). **Ornamental flowering plants experimentally infected with curly top.**—*Hilgardia*, x, 9, pp. 263–302, 4 pl., 21 figs., 1936.

Curly top of beet [*R.A.M.*, xvi, p. 294] was experimentally transmitted in the greenhouse by the leafhopper *Eutettix tenellus* to 92 species of ornamental flowering plants, in 73 genera belonging to 33 families [cf. ibid., xii, p. 446; xiv, p. 171], including [besides those already noted] *Dianthus barbatus*, *Nigella damascena*, *Papaver nudicaule*, *P. orientale*, *Hesperis matronalis*, *Reseda odorata*, *Pelargonium hortorum*, *Tropaeolum peregrinum*, *Clarkia elegans*, *Primula* spp., *Phlox drummondii*, *Myosotis scorpioides*, *Salvia splendens*, *Digitalis ambigua*, *Chrysanthemum frutescens*, and *Tagetes patula*, the virus being recovered

from each species or variety by previously non-infective leafhoppers, and transferred to sugar beets. Fifteen species failed to develop disease symptoms, though the virus was recovered from them. Apart from stunting, chlorosis, and curling of the leaves, many of the infected plants developed cleared veins, while some showed a roughening of the lower surface of the leaves after the veinlets had cleared, both being reliable symptoms of curly top on sugar beet; the veins in these plants developed numerous tiny, wart-like elevations, papillae and swellings resembling galls developing on the distorted, thickened veins as the disease progressed. Young infected plants frequently produced no flowers, while older plants infected before blooming often developed few, dwarfed, malformed flowers.

NOBLE (MARY). **The morphology and cytology of Typhula trifolii Rostr.**—*Ann. Bot., Lond.*, N.S., i, 1, pp. 67–98, 2 pl., 7 figs., 1937.

A full account is given of the author's morphological and cytological studies of *Typhula trifolii* [*R.A.M.*, xv, p. 725] obtained in pure culture from sclerotia found mixed with clover seed imported from Poland. The results showed that *T. trifolii* is heterothallic, and the nuclear phenomena associated with fusion are discussed in considerable detail. Three types of clamp-connexions are described in *T. trifolii*, the first two of which correspond to the two types described by Bensaude in *Coprinus*, while the third, rare type is characterized by the hook growing backward as a small branch, a bridging hypha then being formed between it and the parent hypha. Sclerotia and fructifications are not usually produced in monospore cultures, but those that are occasionally formed are smaller than diploid sclerotia and fructifications, while being otherwise very similar to the latter; the spores of haploid fructifications are smaller than those of the diploid.

ASKEW (H. O.) & THOMSON (R. H. K.). **Occurrence of internal cork of Apples in Central Otago, New Zealand.**—*N. Z. J. Sci. Tech.*, xviii, 8, pp. 661–664, 1937.

A pitting of Sturmer, Jonathan, Dunn's, Canada Reinette, Cox's Orange, French Crab, Rymer, Yorkshire Greening, and Tasma apples in Central Otago, New Zealand, is considered to be identical with the internal cork observed in the Nelson district, and like the latter to be directly correlated with a low boron content of the soil and fruit [*R.A.M.*, xvi, p. 325].

12. Konferenz betr. die Bekämpfung der Krankheiten und Schädlinge der Obstbäume an der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. [12th conference on the control of fruit tree diseases and pests at the Federal Experiment Station for Fruit Growing, Viticulture, and Horticulture at Wädenswil.]—*Schweiz. Z. Obst- u. Weinb.*, xlv, 26, pp. 478–511, 1936.

From the experiments described in the papers herein presented by A. Osterwalder, M. Staehelin, and others, it appears that the so-called 'blue spraying' (4 to 6 per cent. Bordeaux mixture applied shortly before the opening of the buds) is effective against shot hole of cherries (*Clasterosporium*) [*carpophilum*: *R.A.M.*, xiii, p. 582] and apple and

pear scab (*Venturia inaequalis* [and *V. pirina*] in certain circumstances which are fully discussed in relation to local climatic conditions.

JOËSSEL (P. H.). **Les principales maladies cryptogamiques des arbres fruitiers en Provence.** [The chief fungal diseases of fruit trees in Provence.]—[*Rev. maroc.*] *Fruits Primeurs*, vi, 70, pp. 346–350, 1936; vii, 72, pp. 49–54, 1937.

Practical notes are given on the symptoms and control of the chief fungal diseases of fruit trees in Provence [south-eastern France], including *Taphrina deformans* [*R.A.M.*, xiv, p. 594; xv, p. 683] on peach and almond, *Clasterosporium carpophilum* on stone fruits, brown rot (*Sclerotinia fructigena* and *S. laxa*) of various fruit trees, *Venturia pirina* on pear, and *V. inaequalis* on apple. The paper concludes with directions for preparing the spray mixtures recommended, and a spray schedule for the different diseases is given in tabular form.

BOUHELIER (R.). **Traitements en hiver.** [Spray applications in winter.] —[*Rev. maroc.*] *Fruits Primeurs*, vi, 70, pp. 341–345, 1936.

Brief, practical notes are given on winter spray treatments of fruit trees and market garden crops in French Morocco against various diseases, including *Exoascus* [*Taphrina*] *deformans* on almond and peach, *Clasterosporium carpophilum* on almond, peach, plum, and cherry, *Sclerotinia cinerea* [*S. laxa*] on almond, peach, plum, and apricot, *S. fructigena* on apple and pear, *Venturia inaequalis* on apple, *V. pirina* on pear, *Leveillula* [*Oidiopsis*] *taurica* on artichoke [*Cynara scolymus*: *R.A.M.*, xv, p. 683], *Alternaria solani* on tomato, and *Phytophthora infestans* [see below, p. 402], which, while relatively rare on tomatoes, causes much damage to potatoes.

QUANTZ (J. J.). **Motorspritze oder ortsfeste Spritzanlage? Ein Beitrag zur Frage des Einsatzes von Spritzgeräten im Obstbau.** [Motor sprayer or stationary spraying equipment? A contribution to the problem of the installation of spray machinery in the orchard.]—*Obst- u. Gemüseb.*, lxxxiii, 1, pp. 8–10, 1937.

Several experiments with a stationary spray outfit in an orchard of over 1,000 apple trees at Pillnitz on the Elbe, Germany, having indicated that an average profit of at least 20 per cent. of the total value of the harvest may be obtained by this method of treatment, a comparative trial was made of the respective merits of motor and stationary equipments. From a consideration of the statistical data yielded by the tests it appears that the annual profits from the motor and stationary appliances may be estimated, respectively, at approximately RM. 1,427 and 1,707. During the summer of 1936 scab [*Venturia inaequalis*] occurred in the experimental orchard in such a destructive form that the motor sprayer was practically useless on account of the lengthy period required for its operations and of the frequent changes of weather, whereas the work could have been completed by three men in a maximum time of 1½ days with the stationary machine. In summing up the pros and cons of the two methods, the writer concludes that the higher installation and spray material costs involved by the stationary outfit are more than counterbalanced by the great

advantages of the latter as compared with the motor appliances, including adaptability to existing requirements, independence of topographical and soil conditions, economy in wages and working costs, and permanent utility for watering and fertilizing purposes.

ARK (P. A.). **Variability in the fire-blight organism, Erwinia amylovora.** —*Phytopathology*, xxvii, 1, pp. 1–28, 2 figs., 1937.

Morphological studies on ten collections of *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xvi, p. 263 and next abstracts] on Bartlett pear, apple, *Crataegus oxyacantha*, *C. crus-galli*, and *Photinia arbutifolia* from various parts of the United States revealed differences in the sizes of individual cells and of the colonies and in the shape of the latter. The length of the bacteria from strongly and moderately pathogenic collections ranged from 0·9 to 1·4 μ, the corresponding figures for weakly pathogenic strains being 1·5 to 1·7 μ. On an eosin-methylene blue medium a metallic lustre was produced by the weakly pathogenic collections only. The range of hydrogen-ion concentrations tolerated by the strains extended from P_H 4 to 8·8 and the upper thermal death points for the weaker and stronger strains were 45·1° to 48·3° and 48·3° to 49·5° C., respectively. The organisms survived on cover glasses for 24 to 36 hours irrespective of the presence or absence of moisture, and from four to ten days in gauze strips.

The collections were found to vary in their capacity for the utilization of sugars, alcohols, glucosides, amino acids, some proteins, fatty acids, and amides. All fermented arabinose, mannose, glucose, fructose, maltose, cellobiose, sucrose, raffinose, and dextrin, with acid production; galactose and lactose were utilized by seven, mannitol by five, glycerol by eight, asparagin (with alkali production) by all, and ammonium and sodium citrates and citric and malic acids by all. Injections of asparagin into a very resistant plant of *Cotoneaster frigida* and into dormant Bartlett and Winter Nelis pears appeared to stimulate infection by *B. amylovorus* on subsequent inoculation. All the collections were able to grow in 50 per cent. sucrose, while three (two from *Crataegus crus-galli* and one from pear) tolerated 60 per cent. Only the pear strain proved incapable of growth in 14 per cent. glucose, while a Californian collection from *C. crus-galli* developed at a concentration of 28 per cent.

The phenomenon of dissociation in *B. amylovorus* was investigated. Ageing of the cultures was invariably accompanied by the appearance of rough forms, the stability of which was maintained in standard solid and liquid media; a reversion to the smooth type, however, followed four to six passages through 2 per cent. sucrose or 1 per cent. glucose nutrient broth. The smooth forms are the more virulent, the rough and intermediate types originating in old natural infections. Among other cultural variants may be mentioned types producing rhizoid, and others translucent colonies, the latter growing slowly in nutrient broth, requiring frequent transplants for perpetuation, and, like the R strains, failing to attack peas, apple, and a number of Rosaceous shrubs. The invasive capacity of *B. amylovorus* was found to undergo a marked decrease in 10 per cent. sucrose broth cultures. In this connexion it is suggested that a strong influence on the rise and decline of fireblight epidemics

may be exerted by the variations in sugar concentration under natural conditions occurring in the nectar of fruit blossoms and by the dissociation of the organism under natural conditions.

ROSEN (H. R.). **Oversummering of fire-blight pathogen, spraying for control of fire-blight, and abscission induced by Erwinia amylovora and Phytomonas syringae.**—*Bull. Ark. agric. Exp. Sta.* 330, 60 pp., 13 figs., 2 graphs, 1936.

Studies conducted in Arkansas of the oversummering of fire-blight (*Bacillus amylovorus*) [*R.A.M.*, xv, p. 515 and preceding and next abstracts] in pear twigs and limbs infected early in the growing season showed a gradual reduction in the number of cases in which the organism was still viable; in July, 1934, under 2 per cent. of the infected limbs and twigs studied showed viable, infectious bacteria, the figure being only 0·78 per cent. in August and nil in September. It appears, therefore, that blighted limbs and twigs of the pear and apple varieties grown in Arkansas are much less important sources of inoculum for the succeeding year's infection than is similar infected material in regions with shorter growing seasons. No correlation was noted between the amount of fireblight on individual apple trees in one season and that present in the next.

In 1933, almost perfect control of fireblight, particularly blossom blight, on Jonathan apples was given by Bordeaux mixture (1–3–50) applied (1) as a cluster bud spray, (2) when 25 per cent. of the blossoms were open, (3) when 25 to 80 per cent. were open, (4) as a calyx spray, and (5) as a first cover spray. In 1935, 50 per cent. control of blossom blight was obtained in another Jonathan apple orchard by applications of Bordeaux mixture (1–3–50), including two at the open-blossom stage, the control trees being treated with the usual lime-sulphur sprays, and two open-blossom lime-sulphur applications. The trees sprayed with Bordeaux mixture in the cluster bud and calyx stages and first cover spray but not in the open-blossom stages showed no better control than the lime-sulphur-sprayed controls, the evidence indicating that the two open-blossom Bordeaux mixture sprays were responsible for the control obtained.

Copper sulphate added to dehydrated potato dextrose agar so as to give a concentration equivalent to that in 1–3–50 Bordeaux mixture completely inhibited the growth of *B. amylovorus* [ibid., xvi, p. 44]. Five mg. of dried 1–3–50 Bordeaux film or of dry film of copper phosphate mixture was completely lethal to approximately 10,000 of the bacteria in 10 minutes, but the same weight of a dry film of copper oxide mixture was toxic to about 80 per cent. of such a population in 10 minutes, and was not completely lethal in 30 minutes. When the bacterial population was greatly increased, and the quantity of a dried film of copper phosphate mixture slightly reduced, toxicity diminished in given time intervals. Lead arsenate showed no toxicity to *B. amylovorus*.

ROSEN (H. R.). **Mode of penetration and of progressive invasion of fire-blight bacteria into Apple and Pear blossoms.**—*Bull. Ark. agric. Exp. Sta.* 331, 68 pp., 77 figs., 1936.

This is an expanded account of author's studies of the mode of

penetration of pear and apple blossoms by *Bacillus amylovorus*, preliminary announcements of which have already been noticed [*R.A.M.*, xiv, p. 370; xvi, p. 157, and preceding abstracts]. The following points may be mentioned. It was demonstrated that the nectarial region of pear blossoms, unlike that of apple blossoms, resides in an open, shallow, fully exposed, saucer-shaped tissue between the points of emergence of the styles and stamens. The droplets of nectar are excreted through stoma-like nectarthodes situated mostly at the base of deep depressions in the nectarial surface, which is entirely covered by a well-defined cuticle. Under the epidermal cells lining the nectarial region is a zone of tissue 12 to 15 layers of cells deep, which probably functions in the manufacture of nectar. Within 24 to 48 hours of the inoculation of open, nectar-secreting pear blossoms the bacteria may be found in great numbers in localized areas on and under the surface of the nectarial tissue, penetration of the nectarthode being in the nature of saprophytic growth of the organism through a natural opening into the interior. Progressive invasion by the bacterial strands was accompanied by discoloration, plasmolysis, coagulation, and disintegration of the protoplasts of cells adjoining or immediately near the sub-nectarthode chamber.

The nectarial tissues of normal apple blossoms showed essentially the same histological structures as those of pear blossoms, but when fully open apple flowers are sprayed with pure cultures of *B. amylovorus* penetrations occur more frequently through the stigmas, anthers, outer receptacle walls, and calyx lobes than through the nectarial tissue.

These studies indicate that in spraying against pear blossom blight it is essential to secure covering of the nectarial disks. In the case of apple blossoms a protective covering appears to be more necessary on the stigmas and anthers than on the nectarial surfaces, though the nectarial tissues, outer receptacle walls, and calyx lobes occasionally serve as centres of penetration.

YOSSIFOVITCH (M.). **Contribution à l'étude de la protection du Prunier contre Polystigma rubrum (Pers.) D.C.** [A contribution to the study of the protection of the Plum tree against *Polystigma rubrum* (Pers.) D.C.]—*Rev. Path. vég.*, xxiv, 1, pp. 18–31, 1937.

The chief plum variety, Požegača, grown in Jugo-Slavia is stated to be particularly susceptible to infection by *Polystigma rubrum* [*R.A.M.*, xiv, pp. 320, 773], the disease being epidemic and sometimes producing complete defoliation during summer. The disease is equally serious in Bulgaria, where the same variety, known locally as Kustendilska, is also the most widely grown.

Ascospore emission always begins, under Jugo-Slavian conditions, when the first leaves appear on the trees, reaching a maximum shortly after flowering, providing the weather is rainy. The last ascospores to ripen were found in July. In three years out of four the most important attacks occurred during the first half of May, while in the fourth year they occurred even earlier. The critical period for control in the vicinity of Belgrade is that of the first prolonged rains after flowering.

Bordeaux mixture is highly fungicidal to *P. rubrum* even at a concentration of only 1 per cent., and one application when 3 to 5 new

leaves are present on each shoot gave adequate control, reducing the leaf-spotting, as compared with the controls, by 70 to 80 per cent. The first applications should be made a little before or after pollination, according to whether leaf development is more or less advanced in relation to flowering. Treatments made two or three weeks after flowering are practically useless.

MILLER (P. W.). **Second report of progress on studies of Prune russet ('scab') and its control.**—*Rep. Ore. St. hort. Soc., 1936*, pp. 90–108, 1 fig., 1937.

A tabulated account is given of the writer's continued studies in 1936 on prune 'russet' or 'scab' in Oregon and Washington [*R.A.M.*, xv, p. 375], from which it appears that the critical period for the development of the disorder extended from the time of husk fall to about a month later. By the time the fruit had reached three-fourths of its full size it was no longer susceptible. The disturbance is considered to arise mainly from mechanical abrasions inflicted during windy weather, and the establishment of windbreaks on the windward sides of exposed orchards is recommended. The Miller's Sweet seedling prune showed less severe russet than the adjacent Italian and Date varieties.

WILSON (E. E.). **Control of Peach leaf curl by autumn applications of various fungicides.**—*Phytopathology*, xxvii, 1, pp. 110–112, 1937.

Experiments were carried out in 1935–6 to determine whether peach blight (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: *R.A.M.*, vi, p. 422] and leaf curl (*Taphrina deformans*) [ibid., xvi, p. 234] could be jointly combated on the Elberta variety under Californian conditions by the spray commonly applied against the former disease between 15th November and 15th December, or if a further spring treatment would be necessary. The incidence of leaf curl was reduced to under 1 per cent. (count made on 7th April following a wave of infection probably initiated by a rainy spell from 26th March to 4th April) by treatment with either: 2–5–50 Bordeaux mixture on 24th October, 5–5–50 Bordeaux on 24th October, 29th November, or 29th January, or basic copper sulphate 3–50 on 29th November, and to 1·0 per cent. by lime-sulphur 4–50 on 29th November, the amount of infection in the unsprayed control plots ranging from 36 to 46 per cent.

STEHLÉ (H.). **Sur une maladie des Bananiers à la Guadeloupe.** [On a Banana disease in Guadeloupe.]—*Rev. agric. Guadeloupe*, viii, 9–10, pp. 153–156, 1936.

This is a popular note on the symptoms, etiology, local distribution in Guadeloupe, and control of the banana disease caused by *Bacterium solanacearum* [*R.A.M.*, xv, p. 778]. Soil disinfection with calcium sulphide, chloride of lime, or calcium cyanamide, especially the two first-named, are stated to have given excellent results. Preventive measures should include the selection of healthy planting material, a rational drainage system, and heavy applications (6 to 10 tons per hect.) of lime to laterite and acid soils.

CHEVALIER (A.) & HEIM (R.). **Le noircissement des Bananes des marchés français.** [Blackening of Bananas in French markets.]—*Rev. Bot. appl.*, xvii, 185, pp. 1–4, 1937.

For some time past large numbers of bananas arriving at French ports and markets from the Canary Islands and Guinea have shown stem-end rot, from infected material of which *Gloeosporium musarum*, a *Fusarium*, and a *Verticillium* were isolated, together with a secondary bacterium in the case of the African fruit. Infection is considered to have taken place through injuries in packing, and was artificially reproduced in the laboratory. It is suggested that treatment with organic colouring agents immediately after cutting or before packing might be helpful in control. The condition is stated to be less common on Gros Michel bananas from the West Indies.

DEMAREE (J. B.) & WILCOX (MARGUERITE S.). **Reducing leaf spot and leaf scorch injury to Strawberry calyces by use of a winter mulch.**—*Plant Dis. Reptr*, xxi, 1, pp. 3–5, 1937. [Mimeographed.]

The commercial value of strawberries in Maryland is liable to be much reduced as a result of dead, discoloured calyces due to leaf spot (*Mycosphaerella fragariae*) and scorch (*Diplocarpon earliana*) [*R.A.M.*, xiii, pp. 712, 786], infection with which is favoured by rains at or just before blossoming, or drought during ripening. Records are presented showing that when five standard varieties were mulched with soy-bean hay and wheat straw in late November to prevent freezing at moderate temperatures, the mulch being loosened in spring, when it served for moisture conservation, the unmulched plants after the winter showed 93 per cent. of the calyces affected (62 per cent. badly), those mulched with soy-bean hay and wheat straw showing 54 (25) and 69 (28) per cent. affected, respectively. The berries from the mulched plots were larger and had far more attractive calyces than those from the unmulched. The soy-bean mulch was superior to the straw as regards the resultant vigour and colour of the plants.

BORZINI (G.). **Ricerche su di una Botrytis parassita dei frutti di Kaki (Diospyros kaki L.).** [Researches on a *Botrytis* parasitic on fruits of Persimmon (*Diospyros kaki* L.)]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, pp. 299–327, 16 figs., 1936. [Latin and English summaries.]

The author describes a fungal rot attacking persimmons in Italy at the stage between physiological maturity and edible ripeness. The first symptom is a small livid spot over a softened area and subsequent development is of three kinds. Fruits may crack and along the crack mycelium and conidiophores of the fungus may develop, the fruit being rapidly invaded. In the second form of the disease the skin of the fruit is not cracked but a very white central tuft of hyphae is surrounded by three zones, the first being mahogany-brown, the second a lighter mahogany, and the third shading off imperceptibly into the healthy colour. Subsequently, the mycelium invades the whole fruit and forms ashy-grey conidiophores. In the third form of rot the external presence of the fungus becomes apparent only when the livid spot has spread considerably. Affected fruits emit a strong odour of alcohol.

The fungus most regularly found in the infected material was identified from its morphological and cultural characters [which are described] as *Botrytis cinerea*, inoculations with which reproduced the condition in healthy persimmons, and also caused rotting in citrus and other fruits. The close similarity between the morphological and cultural characters and parasitism of the author's fungus and Brizi's descriptions of *B. diospyri* (*Staz. sper. ital.*, xxxiv, p. 767, 1901) and *B. citricola* (*Rend. Accad. Lincei*, xii, [pp. 318–324], 1903) indicate that very probably the two last-named are identical with *B. cinerea*.

Böttcher (F. K.). **Bienensterben durch Schädlingsbekämpfung?** [Bee mortality caused by pest control?]—*Angew. Chem.*, 1, 3, pp. 81–84, 1937.

In connexion with a study of the harmful effects on bees of various plant protectives in common use it is stated that copper sulphate, extensively applied in Germany against *Peronospora* of the vine [*Plasmopara viticola*], *Fusicladium* [*Venturia* spp.] in orchards, and weeds constitutes no serious menace to the insects in concentrations up to 3 per cent., even when sprayed in the open blossoms, the minimum lethal dose being 3 γ metallic copper [*R.A.M.*, xvi, p. 188]. Lime-sulphur, on account of its repellent odour, is also unlikely to injure bees, and the same is probably true of sulphur and barium sulphide.

Baker (R. E. D.) & Wardlaw (C. W.). **Studies in the pathogenicity of tropical fungi. I. On the types of infection encountered in the storage of certain fruits.**—*Ann. Bot., Lond.*, N.S., i, 1, pp. 59–65, 1937.

From a brief survey of previous work of various investigators the authors show that the common decay-inducing organisms on certain tropical fruits in storage may be divided into two groups, namely, those that become established as latent infections during the development of the fruit in the field, and the wound parasites present on the surface of the fruit, which usually gain access to the inner tissues during harvesting and storage handling. The tabulated results of their own studies showed that the surface washings from grapefruit collected from six localities in Trinidad contained 25 species of fungi, which are listed, many occurring consistently irrespective of locality. Isolations from the rind of surface sterilized, full-grown grapefruits demonstrated the constant presence in it of three, possibly four, organisms as latent infections, namely, *Phomopsis* [*Diaporthe*] *citri*, *Colletotrichum gloeosporioides*, a tentative species of *Glomerella* which is still under investigation, and *Fusarium* (?) *expansum*, the significance of which has yet to be determined. The *Glomerella* sp. and *C. gloeosporioides* were also found as latent infections in papaws and mangoes, as well as a species of *Phomopsis* closely allied to or possibly identical with *P. citri*. Work is now in hand to determine at what stage in the development of the fruits these fungi become established as latent infections, the data already obtained indicating that some are established very early.

There was evidence that the fungi found in the surface washings of

grapefruits are commonly present in tropical plantations; their spores, which remain viable on the surface of the fruit, are liable to cause rotting later through injury to the epidermis.

COPISAROW (M.). **The metabolism of fruit and vegetables in relation to their preservation.**—*J. Pomol.*, xiv, 1, pp. 9–18, 1936.

Experimental results are given showing that maleic acid, besides protecting apples, pears, bananas, pineapples, and potatoes from mould and decay [*R.A.M.*, xiv, p. 450] also inhibited the ripening process and germination of these products, a property which it was shown to share with etherial extracts of apples freed from the solvent and dissolved in inert esters. The chemical and physiological similarity of maleic acid and the natural inhibitor in the apple extract, taken in conjunction with the facts that at maturity the inhibitor is succeeded by ethylene as an accelerator, and that there is a constitutional link between maleic acid and the acid fruit constituents, as well as the possible degradation of maleic acid to ethylene, suggested to the author the possibility that maleic acid is identical with the natural inhibitor, studied in greater detail by Kockemann under the name 'blastokolin' (*Ber. dtsch. bot. Ges.*, lii, p. 523, 1934), and that the transition of this inhibitor into the accelerator is represented by the degradation of maleic acid into ethylene.

Besides elucidating an important phase in fruit metabolism, this conception is considered to open up a new field in the problem of fruit and vegetable preservation.

[A brief note on the same subject emphasizing the possibility of substituting the natural inhibitor (maleic acid) for poison sprays as a mode of augmenting the plant's natural means of protection is published in *Science*, N.S., lxxxv, 2196, pp. 120–121, 1937.]

DAVIES (C.) & SMYTH-HOMEWOOD (G. R. B.). **Investigation on machinery used in spraying. Part III. The output and range of nozzles and guns.**—*J.S.-E. agric. Coll., Wye*, xxxix, pp. 61–72, 1937.

In these further studies [*R.A.M.*, xiv, p. 778] the authors describe an apparatus for measuring the output of spray nozzles, consisting of a large-mouthed funnel big enough to admit any ordinary nozzle cluster, suspended at an angle and provided with a bend so as to break the force of the spray and prevent loss by splashing before the liquid was caught in a vessel suspended on a spring balance. The nozzle being tested was directed by hand away from the funnel until the pump was working at the required pressure, when it was whipped into the funnel for 60 seconds, the weight of liquid (water) delivered being noted and the output in galls. per min. evaluated. The results obtained with a number of nozzles (which are briefly described) are tabulated, showing the output in galls. per minute varied from 0·40 to 5·80 at 200 lb. pressure and from 0·65 to 10·00 at 500 lb.

The effective range of a nozzle was measured to within 6 in. as follows. Its mean effective carry was first judged by competent observers out-of-doors on a still day. The test apparatus was then assembled, consisting of an opposing nozzle producing a wide cone of spray and directed

through a large, louvred funnel towards the nozzle being tested. The pump pressure supplying the opposer was regulated to 170 lb. and the nozzle under test, mounted on a stand on rails, was moved either forwards or backwards until the spray line of demarcation, showing the mean effective carry, was indicated by means of a light aluminium plate suspended on wires and brought into position opposite a pointer. The effective ranges of the nozzles tested varied from 6 in. to 23 ft. at 200 lb. pressure and from 2 ft. to 34 ft. at 500 lb.

Throughout their investigation of the spray gun the authors were impressed with the potentialities of this apparatus, which they consider to be superior to all other spray tools for large and medium trees, though possessing certain serious defects, i.e., the control knob requires to be adjusted continually to produce the desired form of spray, and the necessity of a stuffing-box. Two new types of gun were therefore designed and made (1) semi-automatic, in which the mere raising or lowering of the lance causes the handle to turn the control knob in the correct direction, and (2) automatic, without control knob or stuffing-box, the mere raising or lowering of the gun automatically adjusting the nozzle. For both guns, single, double, and triple nozzle clusters, straight and angled, were designed and successfully tested in the field under commercial conditions. The results of tests of five guns for output and effective range are tabulated.

GALLWITZ (K.). **Aus der Technik der Schädlingsbekämpfung.** [A note on the technique of pest control.]—*Chemikerztg*, lx, 75, pp. 764–766, 4 figs., 2 graphs, 1936.

Aluminium having been proposed as a substitute for brass for spraying-machine parts, samples of the former metal were exposed to the action of Bordeaux mixture, lime-sulphur, nicotine, and nosprasit, and shown to be severely corroded; the protection afforded by a layer of eloxal was inadequate to prevent serious injury. Certain firms are offering rustless and nitralloy steel [cf. *R.A.M.*, xv, p. 452] for the purpose in view, but these metals, though useful for the construction of individual parts, are too costly for use on a large scale.

MUNN (M. T.). **Toxic effect of certain seed treatments as revealed in germination response.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1936*, p. 92, 1936.

The author calls attention to the difficulties encountered in seed germination tests in germinating disinfected seeds. Poisoning from treatment [cf. above, p. 377] with red copper oxide, for instance, begins when the seeds are placed on blotters to germinate, though seeds given the same treatment do not show this condition when germinated in soil, in the presence of organic matter competing with the copper. Also, slow or erratic germination may result from failure of the seed to take up water owing to the coating of disinfectant, e.g., cabbage seed coated with zinc oxide. Garden peas seed treated with red copper oxide and graphite, or graphite alone, may show retarded germination, the severity of the condition apparently depending on the variety of peas and the amount of covering still adhering.

Isačenko [Issatschenko] (B.). **Sur la corrosion du béton.** [On the corrosion of concrete.] *C.R. Acad. Sci. U.R.S.S.*, ii (xi), 7, pp. 287–289, 1936. [Received March, 1937.]

After briefly referring to the paper by Paine and his collaborators [*R.A.M.*, xii, p. 644] on the relationship of micro-organisms to the decay of stone, the author gives a preliminary report on the results so far obtained in the investigation, started in 1933, on the causes of the corrosion of cement and concrete constructions in fresh waters in the Leningrad region. Submerged concrete walls of electrical works were found to be covered with a compact mucus composed of a rich bacterial flora together with *Oospora lactis*, and species of *Candida* and *Sporotrichum*. The bacteria comprised both nitrifying and denitrifying organisms together with thiosulphate bacteria, and pure cultures of the last-named were shown to be capable of attacking and dissolving concrete, but only in the absence of calcium in the culture medium. The concrete-destroying action of the fungi is believed to be mainly due to their modifying action on the P_H value of their substratum in the presence of ammonium salts, which was reduced from 5·6 to 2·7 by *Candida* and from 5·6 to 2·6 by *Sporotrichum*. It is further believed that the decay of concrete constructions is brought about by the dissolving effect of the micro-organisms on the external protective layer, 0·2 or 0·3 mm. thick, of calcium carbonate on the surface of the constructions, this allowing water to penetrate inside the concrete, where the decay is further carried on by the thiosulphate bacteria.

Stakman (E. C.). **The promise of modern botany for man's welfare through plant protection.**—*Sci. Mon., N.Y.*, xliv, 2, pp. 117–130, 1937.

This is a stimulating discussion of some outstanding recent developments in the field of plant protection, illustrated by numerous striking examples of parasitic diseases of economic crops and the attempts in constant progress at their control by ecological adaptation, quarantines, eradication campaigns, improved cultural practices, antibiosis, chemical immunization, fungicidal treatments, and breeding for resistance.

Harry (R. G.). **Mould growth on paint films and its prevention.**—*Paint Varn. Lacq. Manuf.*, vi, 10, pp. 309–311, 6 figs., 1936.

Inoculation tests are described with a number of moulds all of which proved capable of growing under experimental conditions of 80 to 90 per cent. humidity at 20° C. on samples of oak, mahogany [*Swietenia mahogoni*], and white pine [? *Pinus strobus*] treated with various paint mixtures [*R.A.M.*, xvi, p. 291]. Under British conditions, no particular material appears to be exclusively responsible for the fungal contamination of paint, suitable media for mould growth being provided by paper, paste, size, and linseed or other vegetable oils. Tests with *Penicillium expansum*, *P. vesiculosum*, *A. glaucus*, and *Fusarium acuminatum* showed that growth can take place on the surface of the paint or distemper itself, although under normal conditions the undercoat may also be involved. *Phoma pigmentivora* Massee (*Kew Bull.*, p. 325, 1911) also

probably grows on the paint film itself, since the red coloration is produced on linseed oil but not on plain malt agar.

Of the various fungicides tested for their efficacy against the paint moulds on Czapek's medium and beer-wort agar, only thymol (0·8 per cent.) and parachlormetacresol (0·3 per cent.) gave satisfactory results, with the exception of mercuric chloride, the high toxicity of which renders it unsafe for general use. Parachlormetacresol is preferable to thymol on economic grounds and may be applied to all groundwork at a strength of 10 per cent. in methylated spirit (or up to 20 per cent. if mould spores are actually known to be present); as an ordinary wash for walls it is effective at 0·2 per cent. The compound should also be incorporated with paint in such a way as to maintain a concentration of 0·3 to 0·4 per cent. in the finished mixture (1 oz. per 16 lb. paint). A fair proportion of zinc oxide, which assists in the inhibition of mould growth, should also be included.

DIXON (H. H.). **Are viruses organisms or autocatalysts?**—*Nature, Lond.*, cxxxix, 3508, p. 153, 1937.

Recent work by Stanley, Bawden, and others [notices of which have appeared in this *Review*] is considered to lend striking support to the opinion long maintained by the writer concerning the autocatalytic (as opposed to organic) nature of viruses [*R.A.M.*, xvi, pp. 114, 212]. This view is based on the absence of a limiting surface between the material of a virus and its host; the velocity of the transmission of its typical symptoms (10 to 30 cm. per hour) in the host tissues; its rapid multiplication; and the infinitesimally small quantities required for inoculation. The autocatalytic theory receives further confirmation from Caldwell's observations on the rapid migration of the viruses from growing tissues [ibid., xvi, p. 346], their passage from cell to cell by way of the plasmodesmata, and their inability to penetrate a barrier of dead cells or unperforated cell walls.

RIVERA (V.). **L'azione biologica a distanza dei metalli. Esposizione di fatti e conferme (1929–1936).** [The biological action of metals at a distance. A survey of the facts and evidence (1929–1936).]—*Ric. sci. Progr. tec. Econ. naz.*, Ser. II, ii, 11–12, pp. 586–603, 1936.

The writer summarizes and briefly discusses some outstanding recent contributions to the knowledge of the action of metals at a distance on various living organisms, including fungi and bacteria [*R.A.M.*, xvi, pp. 48, 200].

MCINTOSH (T. P.). **Potato notes.**—*Scot. J. Agric.*, xx, 1, pp. 67–70, 1937.

Leaf roll appears to be more prevalent in Scotland [*R.A.M.*, xiii, p. 721] among the very slow-sprouting potato varieties, such as Golden Wonder, Arran Consul, President, and Bishop, possibly owing to the palatability to aphids of the succulent foliage at the critical period of invasion. An exception to the rule is constituted by the quick-sprouting British Queen, a very susceptible variety, but none of the slow-sprouting varieties are resistant to the disease.

During the recent dry seasons Golden Wonder has been affected by a disorder frequently confused with spraing [ibid., xv, p. 468] but

characterized by a reticulate, brown discoloration of the vascular tissues, and most conspicuous at the heel-end; though not absolutely identical with net necrosis [ibid., xiv, p. 253], this is the term that most aptly describes the condition at the present stage of the studies. Another common disturbance of Golden Wonder, loosely referred to as 'spraing', is internal rust spot [ibid., xvi, p. 118], in which the flesh of the tubers shows irregular, rusty-brown markings ranging from mere specks to blotches 1 cm. or more in diameter.

KLAPP (E.). **Vordringliche Forschungsziele bei der Bekämpfung des Kartoffelabbaus.** [Urgent aims of research in the control of Potato degeneration.]—*Forschungsdienst*, iii, 1, pp. 10–11, 1937.

Among the lines of approach to the problem of potato degeneration control in Germany [*R.A.M.*, xvi, p. 51] the following are in urgent need of attention: testing of certifiable varieties for their reaction to specific virus infections: development of processes for the early testing of planting material; more intensive studies on known modes of infection and the discovery of unknown sources; trials on the effects of selection under varying environmental conditions; experiments on the average distance travelled by the viruses in relation to field practices; and accurate observations on the influence on degeneration of planting and harvest time, density of stand, errors in the fertilizing scheme, and the like, in the principal seed potato-producing areas.

MERKENSCHLAGER (F.). **Nederling und Dahlem. Ein Vergleich zweier Versuchsfelder in Bezug auf die Abbaufrage.** [Nederling and Dahlem. A comparison of two experimental fields in relation to the degeneration problem.]—*Prakt. Bl. Pflanzenb.*, xiv, 10–11, pp. 299–307, 2 figs., 3 diags., 1937.

In connexion with a comparative investigation on the respective merits of Nederling (Bavaria) and Dahlem (Berlin) as potato-growing localities the writer discusses the complex problem of the interplay of geological, climatic, and meterological factors on the group of pathological manifestations known as 'degeneration' [see preceding and next abstracts]. The environmental conditions conforming most closely with those obtaining in the primeval home of the potato—a cool, damp growing period culminating in a hot, dry harvest—are to be found in the sub-Baltic regions, notably Pomerania, and certain other districts of Germany, and it is here that the best average yields (though not necessarily the largest in a given season) will be secured. Excessively high yields may, indeed, be the immediate outcome of climatic influences which must eventually disturb the natural rhythm and constitution of the plant, i.e. a hot, dry June and July and a damp, cold September. Nederling, with its heavy rainfall, is less liable to severe degeneration over a lengthy period than Dahlem, but the adverse effects of cultivation in the latter region are apt to be largely disguised, more especially when mineral fertilizers are liberally applied.

LOEW (O.). **Über den Abbau der Kartoffeln.** [On Potato degeneration.] —*Prakt. Bl. Pflanzenb.*, xiv, 10–11, pp. 308–310, 1937.

In discussing the etiology of potato degeneration [see preceding

abstracts] the author states that infestation of the leaves with aphids (*Myzus persicae*) only occurs when degeneration has already begun. Hiltner and Lang showed (*Landw. Jb. Bayern*, 1921) that degeneration was preventable at Nederlingen by trebling the normal quantity of stable manure but not even by quadrupling the customary amount of mineral fertilizer. This observation is considered to indicate the decisive influence on degeneration of the water-holding capacity of the soil. The water balance, in fact, in relation to the primitive rhythm of the plant, is thought to be the pivot on which the health of the potato turns, and any disturbance of the equilibrium will be reflected in symptoms of degeneration.

WARTENBERG (H.). **Probleme der Forschungen über den Abbau der Kartoffel. I. Pflanzzeit des Pflanzgutbaues und Pflanzgutwert der Ernte.** [Problems involved in the investigation of degeneration of the Potato. I. Time of sowing in the production of seed material and the seed value of the crop.]—*Züchter*, ix, 2, pp. 35–40, 10 graphs, 1937.

The author states that the results of the so-called 'day plot experiments' [*R.A.M.*, xiv, p. 387] in Dahlem and of Berkner's and Hecker's work in Breslau [ibid., xv, p. 457], supported by other evidence from the relevant literature, indicate that in Germany the spread of potato degeneration [virus] diseases [see preceding abstracts] in the field increases from the earliest to the later sown potatoes up to a certain date (either in June or July), after which the incidence and severity of infection in the later sown crops sharply declines. The later the potatoes are sown after the critical date the healthier they are, but their yield progressively declines both in quantity and in seed value. The Dahlem 'day plot experiments' were repeated by the author in 1935–6, and while no definite conclusion could be arrived at regarding the precise date of the critical period since the varieties varied considerably, there was some evidence that potato crops are most liable to infection when the shoots breaking through the soil are exposed to a relatively high temperature; excessive air dryness and sunshine during the first two weeks after emergence of the shoots also appear to favour infection. The application of these findings to control, by spraying the fields with water or some other fluid during the critical period, with the object of suppressing the insect vector population on the potatoes during that time, is briefly discussed.

KÖHLER (E.). **Die Resistenzzüchtung gegen den Kartoffelabbau im Lichte der Virusforschung.** [Breeding for resistance to Potato degeneration in the light of virus research.]—*Züchter*, ix, 1, pp. 13–15, 1937.

From the practical standpoint the only viruses to be considered in the German potato-breeding programme for resistance to degeneration [*R.A.M.*, xvi, p. 269, and preceding and next abstracts] are leaf roll, Y (streak), and A, and a further simplification may be introduced by the close relationship, amounting virtually to identity, between the two last named, both of which are readily transmissible by rubbing and by *Myzus persicae*, are communicable to tobacco, and lose their

virulence on the exposure of the sap to temperatures above 55° C. Resistance to the relatively strong Y virus automatically connotes a similar reaction to the weaker A. It should be noted, however, that a blend of A and X viruses, the latter innocuous in itself, may result in a virulent combination inducing streak or crinkle symptoms [ibid., xvi, p. 337]. A clear distinction should be drawn between 'defensive resistance' and 'tolerance' in a given potato variety towards a virus, the former being far preferable from the breeding point of view and implying the existence of constitutional protective quantities, whereas the latter is at best a makeshift that does not exclude the risk of conveying 'masked' infection to neighbouring susceptible sorts.

BOTJES (J. G. O.). **Verschil in virulentie bij het virus van de stippelstreepziekte in de Aardappelplant.** [The variation in virulence of the stipple streak disease virus in the Potato plant.]—*Tijdschr. PlZiekt.*, xliii, 1, pp. 1–10, 1937. [English summary.]

Considerable differences have been observed in the virulence of the stipple streak (acropetal necrosis) virus of potatoes [*R.A.M.*, xvi, p. 118], which is harboured in a masked form by a number of Dutch varieties. For instance, the Zeeuwsche Blauwe virus is very virulent to Eersteling [Duke of York] and slightly so to Noordeling and Muntinga 17, whereas the infective principle contained in Eigenheimer severely attacks Noordeling and Muntinga 17 and causes relatively little injury to Duke of York. The Thorbecke virus is equally virulent to Duke of York, Noordeling, and Muntinga 17. The variations in virulence are manifested both in tuber-grafting and plant to plant inoculation tests and are expressed in the more or less rapid spread of the symptoms within the plants. In cases of very slow spread, e.g., where Noordeling and Muntinga 17 are infected by Zeeuwsche Blauwe, healthy progeny may be produced by the diseased tubers.

BOUHELIER (R.). **Les principales affections de la Pomme de terre.** [The chief Potato diseases.]—[*Rev. maroc.*] *Fruits Primeurs*, vi, 69, pp. 213–217, 2 figs., 1936.

Brief, popular notes are given on the symptoms and control of the potato diseases found in French Morocco [cf. *R.A.M.*, xv, p. 171], including leaf roll, mosaic, 'frisolée' [ibid., xvi, p. 298], 'bigarrure' [streak], black leg [*Bacillus phytophthorus*], mildew [*Phytophthora infestans*: see above, p. 389], *Alternaria* disease [*A. solani*], *Verticillium* disease [*V. albo-atrum*], black *Rhizoctonia* disease [*Corticium solani*], dartrose [*Colletotrichum atramentarium*], sclerotial disease [*Sclerotinia sclerotiorum*], common scab [*Actinomyces scabies*], and powdery scab [*Spongospora subterranea*], which is very rare in North Africa. Wart disease [*Synchytrium endobioticum*: ibid., xvi, p. 288] has not been reported for the country.

SCHLUMBERGER [O.]. **Die Erzeugung krebsfester anerkannter Pflanzkartoffeln in den Jahren 1934 und 1935.** [The production of wart-immune certified seed Potatoes in the years 1934 and 1935.]—*NachrBl. dtsch. PflSchDienst*, xvii, 1, pp. 4–6, 1937.

From this tabulated account of the production of seed potatoes

immune from wart disease [*Synchytrium endobioticum*] in Germany in 1934 and 1935 [*R.A.M.*, xv, p. 44] it appears that these varieties comprised 66·4 per cent. of the total material submitted for examination in the former year and 74·5 per cent. in the latter, compared with 55 per cent. in 1933. A marked extension was registered in the cultivation of a number of yellow-fleshed table varieties designed to replace Industrie, e.g., Erdgold, Ovalgelbe, Preussen, Goldwährung, Goldgelbe, Ackersegen, Voran, Jubel, and Daber, of early sorts in general and Flava in particular, and of the starchy group represented by Parnassia.

LEHMANN (H.). **Das heutige Ausgangsmaterial für die Züchtung Phytophthora-widerstandsfähiger Kartoffeln.** [The existing primary material for the breeding of *Phytophthora*-resistant Potatoes.]—*Züchter*, ix, 2, pp. 29–35, 1937.

The author states that his further investigations (not yet published) have demonstrated the existence of eight different biotypes of *Phytophthora infestans* on potatoes [*R.A.M.*, xv, p. 600], widely divergent in their pathogenicity to the wild and semi-wild species of potatoes (*Solanum*) included in the collection at the Kaiser Wilhelm Institute, Müncheberg, Mark. The results [which are tabulated] of artificial inoculation tests, confirmed by field observations, indicated that of this collection *S. demissum* El Desierto alone was immune from all the eight biotypes, while *S. demissum utile* was more or less susceptible to biotype 8; *S. demissum* Lindley 029 proved to be consistently susceptible to this form, *S. ajuscoense* in one case to biotype 6, *S. polyadenium* to biotype 5, and *S. demissum tlaxpehualcoense* to biotype 4. Besides having considerably reduced the number of potato species showing complete immunity from *P. infestans*, the investigations are considered to illustrate the difficulties inherent in the breeding of resistant potato varieties from the material available at the present time, in view of the facility with which the parasite appears to produce new biotypes of unknown pathogenicity.

SCHLUMBERGER [O.]. **Kartoffelsorten-Prüfung auf Schorfwiderstandsfähigkeit.** [Potato variety testing for scab resistance.]—*Mitt. Landw., Berl.*, lii, 3, pp. 52–53, 1937.

As in previous years, official trials were conducted in the Mark Brandenburg in 1936 on the reaction to scab [*Actinomyces scabies*] of potato varieties on three different types of soil—light sand, medium to heavy loam, and soft loam [*R.A.M.*, xii, p. 589; xv, p. 250]. Early varieties were observed to fluctuate much more in respect of susceptibility to infection than the later sorts. The systematic application of physiologically acid fertilizers [ibid., xvi, p. 58] and green manures will largely reduce the incidence of the disease in the semi-resistant varieties. Of the varieties tested for the third consecutive year in 1936, only Volltreffer, Weisses Rössl, and Frühauf satisfied the requirements for practical resistance (at least 60 per cent. of marketable tubers). Of the varieties placed on the standard list in 1936 as a result of the susceptibility tests, Aal, Ackersegen, Jubel, Treff As, and Weisses Rössl are commercially resistant, Edelragis, Erdgold, Ovalgelbe, and Robinia

are moderately resistant, while a lesser degree of resistance is shown by Altgold, Estimata, and Lichtblick.

NOLL (A.). **Der Kartoffelschorf.** [Potato scab.]—*Forschungsdienst*, iii, 1, pp. 26–34, 1937.

This is a review of contemporary literature on potato scab (*Actinomyces scabies*) [see preceding abstract] discussed under the headings of distribution and economic importance, symptomatology, etiology, the genus *Actinomyces*, influence of (*a*) temperature and humidity, (*b*) hydrogen-ion concentration, (*c*) liming, (*d*) soil constitution, (*e*) mineral fertilizers, and (*f*) organic fertilizers, and control.

AHMLING (H.). **Schorfbefall der Kartoffel.** [Scab infection of Potato.]—*Dtsch. landw. Pr.*, lxiv, 5, p. 54, 1937.

Scab [*Actinomyces scabies*: see preceding abstracts] was prevalent in the 1936 potato crop in the Schlotfeld district of Holstein. Of the five varieties grown by the writer, the medium-early Goldappel and Gelbe Nation were the most severely affected on sandy soils while remaining healthy on black humus. The medium-early Erdgold continues to give satisfaction in respect of scab resistance, as does the somewhat later Nordost Goldgelbe; the newly introduced Edda was also resistant.

EDDINS (A. H.). **Sclerotinia rot of Irish Potatoes.**—*Phytopathology*, xxvii, 1, pp. 100–103, 2 figs., 1937.

In cool, wet weather in 1934 *Sclerotinia sclerotiorum* caused heavy damage to the Hastings (Florida) potato crop [*R.A.M.*, xv, p. 781], the yield of which was reduced by up to 25 per cent. Infection was confined to the aerial parts of the plants, the main stem usually being attacked at the soil-line. All the invaded parts, except the lignified tissues, are destroyed, the obstruction of the water-supply leading to the wilt and ultimate collapse of the plants. Sclerotia are formed on the affected surfaces and in the interior of the stems; a single sclerotium gives rise to 1 to 6 apothecia and in 1935 these were observed in the field on 8th February, 11 days before the appearance of the disease on the plants. Both ascospores and mycelium are instrumental in the infection of the stems and leaves. In comparative inoculation tests with *S. sclerotiorum*, *S. minor* [ibid., xv, p. 420; xvi, p. 160], and *S. intermedia* [ibid., xi, p. 556], the first and second infected 20 and 11 out of 20 plants, respectively, producing indistinguishable symptoms, while the third gave entirely negative results. *S. sclerotiorum* was observed on three new hosts in the field, viz. *Calendula officinalis*, *Erechtites hieracifolia* [*E. praealta*], and *Radicula obtusa* [*Nasturtium obtusum*].

BONDE (R.). **A bacterial wilt and soft rot of the Potato in Maine.**—*Phytopathology*, xxvii, 1, pp. 106–108, 1 fig., 1937.

Considerable damage was caused to the Aroostook County, Maine, potato crops in 1934–5 by a chlorotic wilting of the leaves and a white to cream-coloured rot of tubers, through which the disease was found to be perpetuated. A bacterium closely resembling *Bacillus carotovorus*

was isolated from infected material and found to be capable of inducing the white tuber rot, but not the foliar symptoms, on inoculation into healthy plants, while negative results were also given by tests with other organisms from the diseased potatoes. The use of new seed stocks appears to be eliminating the disorder.

Reyes (G. M.). **Rice hybrids versus stem rot disease.**—*Philipp. J. Agric.*, vii, 4, pp. 413–418, 3 pl., 1936. (Issued 1937.)

Field experiments carried out in the Philippine Islands to determine the different reactions to *Sclerotium oryzae* [*Leptosphaeria salvinii*: *R.A.M.*, xvi, p. 202 and next abstract] of new rice hybrids developed by the former Bureau of Agriculture, Alabarg, Rizal, showed that Raminad Str. 3, a product of a cross between Ramay and Inadhica, had moderately high resistance, as well as considerable resistance to *Cercospora oryzae* [ibid., xv, p. 60], while also giving outstandingly high yields. It possesses a distinct type of grain, carrying a combination of the features of both parents, and the size of the kernel is intermediate between broad and slender characters; furthermore, the late-maturing character of the resistant female parent was satisfactorily reduced in the hybrid by about two weeks. Other hybrids that have proved reasonably resistant so far to *L. salvinii* are Ramay×Inadhica Str. 3, and Elon-elon×Inadhica Str. 3.

Baldacci (E.) & Ciferri (R.). **Ricerche ed esperienze sulle malattie del Riso (Oryza sativa L.). I. Prove di patogenicità di funghi diversi per le piantine di Riso.** [Researches and experiments on Rice diseases (*Oryza sativa* L.). I. Tests of the pathogenicity of different fungi for Rice seedlings.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, pp. 161–184, 8 figs., 1936. [Latin and English summaries.]

A description is given of three series of inoculation experiments carried out to ascertain the relative pathogenicity to rice seedlings of (1) *Piricularia oryzae* (Hemmi's strain) [*R.A.M.*, xii, p. 784 and next abstract], (2) *P. oryzae* (Schwarz's strain), (3) *Corticium rolfsii*, (4) *C. centrifugum*, (5) to (8) *Sclerotium oryzae* [*Leptosphaeria salvinii*: see preceding abstract] (Curzi's strain, and strains II, I.M.I., and Nakata I), (9) *Helminthosporium sigmoideum* [*L. salvinii*], (10) *H. oryzae* [*Ophiobolus miyabeanus*: ibid., xvi, p. 202] (Hemmi's strain), (11) *H. oryzae* (strain Miyake (II)), (12) *O. miyabeanus*, (13) *H. sativum* (from wheat) and (14) to (17) four undetermined strains of sterile Basidiomycetes; strains 1, 2, 6, 7, 8, 10, and 11 were obtained from Baarn, strains 3, 4, and 5 from Rome, strains 9, 12, and 13 from Pavia, and the four last were isolated by the authors. In the first series, the germinating, sterilized seed was sown on agarized Sachs's solution and transfers of the fungus made at the same time in proximity to the seeds. In the second, the seeds were sown in one arm of a V-shaped tube containing sterilized soil while the fungus was inoculated into the other arm. In the last series, the seeds were germinated in sand wetted with Sachs's solution and inoculated directly by means of an aqueous suspension of the conidia or direct sowing of the sclerotia.

The results obtained [which are tabulated and discussed] showed that in order of virulence *C. rolfsii* and *C. centrifugum* came first, each killing all the seedlings in due course, followed in order by *S. oryzae*, *P. oryzae*, *H. oryzae* (including *O. miyabeanus*), *H. sigmoideum*, the four Basidiomycetes, and *H. sativum* which averaged, respectively, 92, 75, 45, 40, 36 (for the four strains), and 20 per cent. plants killed.

These results do not completely agree with those obtained in similar experiments in Japan, particularly as regards *H. oryzae* and *C. centrifugum* [ibid., viii, p. 263], probably owing to differences in the experimental conditions, but they do agree with general observations on the specialization of the fungi on the various parts of the hosts. It is concluded that all the fungi tested are injurious to rice.

HEMMI (T.), IKEYA (D.), & INOUE (Y.). **Influence of Ophiobolus miyabeanus on the penetration of Piricularia oryzae in the host body.**—*Agric. & Hort.*, xi, pp. 953–964, 1936. [Japanese. Abs. in *Jap. J. Bot.*, viii, 4, p. (99), 1937.]

The admixture of *Piricularia oryzae* conidia with those of *Ophiobolus miyabeanus* [see preceding abstract] results in a reduction both of germination and of germ-tube length in the former organism, the same effects following the substitution of a culture filtrate of *O. miyabeanus* for the conidia. The process further caused a considerable diminution in the pathogenicity of *P. oryzae* [to rice], *O. miyabeanus* being similarly affected to a much lesser extent. Neither fungus was influenced by the admixture of *Fusarium oxysporum* conidia.

TCHEREMISSINOFF (N. A.). Микромицеты, наиболее распространенные на Тау-сагызе, **Scorzonera tau-saghyz Lipsh. et Bosse.** [The micromycetes most common on Tau-saghyz (*Scorzonera tau-saghyz* Lipsh. & Bosse).]—*Тр. Воронежск. Госуд. Унив.* [*Trans. State Univ. Voronezh*], ix, pp. 83–97, 5 figs. [?1936]. [English summary.]

This is an annotated list of the parasitic fungi recorded from 1933 to 1935, inclusive, in various regions of the U.S.S.R., Russian Central Asia, and Kasakhstan, on *Scorzonera tau-saghyz*, where this plant is being increasingly cultivated as a source of rubber under the vernacular name 'tau-saghyz' [cf. *R.A.M.*, xvi, p. 123]. The economically most important fungi are *Sclerotinia libertiana* [*S. sclerotiorum*], causing a white, wet rot of the root system, with an incidence of 8 to 15·5 per cent.; *Botrytis cinerea* responsible for a serious crown rot; and a species of *Fusarium* giving rise to isolated centres of decay along the whole length of the roots. The last-named is frequently associated with a condition in which a considerable portion of the root, below the point of attack, is transformed into a solid mass of rubber, and experiments are now in hand to establish whether this condition is due to its activity and to test the economic possibilities of its use for this purpose. The leaf parasites include three species which are described as new [with Latin diagnoses], namely, *Septoria tau-saghyzi* (pycnidia immersed, 77·5 to 107·1 μ in diameter, with filiform, straight or curved, hyaline, uni- to triseptate spores, 21·5 to 34·4 by 1·3 to 2·1 μ); *Phyllosticta tau-saghyzi* (pycnidia immersed, 67·8 to 83·6 μ in diameter, with rod-shaped

spores, rounded at both ends, and 6·4 to 8·8 by 2·1 to 3·5 μ); and *Phoma tau-saghyzi* (pycnidia first immersed, then erumpent, globose or depressed, 76·6 to 122·4 μ in diameter, with elongated elliptical or rod-shaped spores, 6·4 to 8·6 by 2·6 to 3·4 μ). A new form, *tau-saghyzi*, of *Leveillula* [*Oidiopsis*] *taurica* [with a Latin diagnosis], is also described on the leaves; it has cylindrical or ovoid asci, 68·8 to 91·8 by 30·6 to 45·9 μ in diameter, with elongated elliptical spores, 30 to 45·9 by 15 to 32·9 μ. Three undetermined species belonging to *Pleospora*, *Mycosphaerella*, and *Macrosporium*, respectively, are also recorded on the leaves.

THOM (C.) & MORROW (MARIE B.). **Fungous mycelia in soil.**—Abs. in *J. Bact.*, xxxiii, 1, pp. 77–78, 1937.

It is possible to divide soil fungi into two groups comprising (1) those capable of living normally in relation to soil organic matter in the chemical sense, i.e., residual products of decomposition, and (2) those concerned in primary decomposition, namely, the breakdown of plant and animal remains into such residual products. The distinction, however, is mainly theoretical. Certain mushrooms, and such organisms as *Actinomyces*, *Penicillium luteum*, *Zygorrhynchus*, and possibly *Trichoderma*, appear to be capable of causing *in vitro* the decomposition of the residual products regarded by the chemist as 'humus'. The majority of soil fungi are directly related to the general disintegration of plant remains in and on the soil surface [cf. *R.A.M.*, xv, p. 51 *et passim*].

WAKSMAN (S. A.). **Associative and antagonistic effects of micro-organisms: I. Historical review of antagonistic relationships.**—*Soil Sci.*, xliii, 1, pp. 51–68, 1937.

A survey of the literature on the antagonistic relationships of micro-organisms, especially those constituting the complex soil population, reveals certain important pertinent facts, which may be summarized as follows. Numerous bacteria, fungi, actinomycetes, and protozoa bring injurious or destructive effects upon themselves or other soil occupants, such effects being sometimes due to competition for nutrients, in other cases to a change in the environmental conditions of the substratum, especially oxidation-reduction potential and reaction, but more often to the formation of definite toxic substances. The production of the latter by specific micro-organisms is strongly influenced by the reaction, temperature, and aeration of the substratum, as well as by the presence of other inhabitants of the soil. Evidence is still lacking as to whether such substances are elaborated in the soil, whether they may be overcome by the organisms affected, and whether they are liable to destruction by other members of the soil population. Without questioning the significance of various specific interrelationships between micro-organisms, no general theory based on 'toxic' or 'antagonistic' phenomena can be proposed before more information is available concerning the mutualistic behaviour of the numerous entities composing the soil population.

A bibliography of 107 titles is appended.

Waksman (S. A.) & Foster (J. W.). **Associative and antagonistic effects of micro-organisms: II. Antagonistic effects of micro-organisms grown on artificial substrates.**—*Soil Sci.*, xliii, 1, pp. 69–76, 1937.

The results are here presented of a detailed investigation at the New Jersey Agricultural Experiment Station on the antagonistic action of *Actinomyces* 3065, isolated from peat soil in Scotland, on various soil fungi, including *Trichoderma lignorum* [*R.A.M.*, xvi, p. 308] and a *Mycogone*, when grown on synthetic media [see preceding and next abstracts]. *T. lignorum* was not greatly affected by the early stages of *Actinomyces*, which was, in fact, gradually overcome by the fungus, but in older *Actinomyces* cultures (7 to 18 days) the former developed only to a limited extent, making the yellowish growth characteristic of this organism under abnormal conditions, while the *Mycogone* was almost completely suppressed. The inhibitory effects of *A.* 3065 (another strain, 3347, was less actively antagonistic to the organisms under observation) were found to be specific in nature and not due to nutrient exhaustion or adverse changes in reaction. The toxic substance was rapidly destroyed by aeration (ten minutes) and by boiling.

Waksman (S. A.) & Hutchings (I. J.). **Associative and antagonistic effects of micro-organisms: III. Associative and antagonistic relationships in the decomposition of plant residues.**—*Soil Sci.*, xliii, 1, pp. 77–92, 1937.

A study was made of the associative growth of different fungi, actinomycetes, and bacteria [see preceding abstracts] on various plant materials and of the resultant decomposition of the latter. The presence of one organism was found to modify considerably the growth of another. Thus, the extent of lucerne decomposition by *Trichoderma* [? *lignorum*] was increased by the presence of certain other fungi, such as *Rhizopus* and *Cunninghamella*, which are themselves unable to attack cellulose. Pure cultures of *Actinomyces* failed to attack maize stalks unless combined with fungi, e.g., *T. lignorum* or *Rhizopus*, while the most extensive decomposition of oat straw was also effected by a mixed soil population.

Sawada (K.). **On the epidemic disease of Cinchona in Formosa.**—*Agric. Rep. Formosa*, xxxii, pp. 1–21, 6 figs., 1936. [Japanese. Abs. in *Jap. J. Bot.*, viii, 4, p. (109), 1937.]

An epidemic disease of *Cinchona* is reported from Formosa, where seedlings 10 to 30 cm. in height are attacked in the seed-beds during the rainy season from May to August. The first symptom is a darkening of the stem, followed by a brown discoloration of the petiole, leaf veins, and lamina, and finally by the death of the plant. Positive results were obtained in inoculation experiments with a non-septate mycelium found in the infected tissues. The fungus, a new species of *Phytophthora*, *P. cinchonae*, differs from that occurring on the same host in India and the Philippines [? *P. palmivora*: *R.A.M.*, xv, p. 410] both in its characteristics and in the symptoms induced.

Cook (M. T.). **The organism causing the dry top rot of Sugar Cane.**—*J. Agric. P. R.*, xxi, 1, pp. 85–97, 3 pl., 1937.

Dry top rot of sugar-cane, attributed by Matz to *Plasmodiophora vascularum* (*Ligniera vascularum* Cook), occurs only in Porto Rico and Venezuela [*R.A.M.*, xiv, p. 397]. The writer disagrees with W. R. Ivimey Cook's conclusion that the disease is due to two rhizopods, *Amoebosporus vascularum* and *A. saccharinum* [ibid., xii, p. 467], and is satisfied that only one organism is involved in its causation. This organism passes, probably in the form of zoospores or as a plasmodium, into the new shoots of the cane, where it is invariably found in the tracheids; in older plants it occurs in other cells. The plasmodia (W. R. I. Cook's amoebae) frequently contain large bodies (W. R. I. Cook's empty cysts) believed by the writer to be resting spores and occurring in large numbers in the tracheids. These structures have been germinated in sterilized distilled water. They develop short germ-tubes by which the zoospores (one to three) probably emerge, though the actual emission of these organs has not been observed. On liberation the zoospores rotate very slowly and gradually assume an amoeboid form. The writer considers that this stage is represented in the tracheids when the individual amoebae unite to form a plasmodium. The resting spores have been observed to show variations in size, but all are believed to belong to the same organism: otherwise two distinct parasites must be presumed to occupy the same cells simultaneously.

With regard to the taxonomic position of the fungus, the writer agrees with Palm and Burk [ibid., xii, p. 468] in their treatment of the Plasmodiophoraceae, and considers that the dry top rot organism would fit into the genus *Sorosphaera* as defined by these authors, when it would become *S. vascularum*, the other alternative being to retain it in *Ligniera*.

King (R. H.). **An abnormality of growth observed in P.O.J. 2878 and P.O.J. 2714.**—*Sug. News*, xviii, 1, p. 9, 1 fig., 1937.

P.O.J. 2878 and 2725 [2714 in title] canes from seed of Formosan origin growing under widely different soil (loam, clay, and sand) and moisture conditions in the Philippines exhibited during the 1936 season a hitherto unnoticed abnormality, consisting in the profuse formation of new shoots over several entire internodes. The shoots arise from the nodal tissues. The rind of the abnormal portions becomes very hard, the nodes assume a fibrous texture, and the internodes are shortened above and below the affected area. False buds or pigmy shoots are produced along the internode. The upper part of the stalk gradually shrinks and finally dies. The root band and false shoots are abundantly encircled by hairs. A convoluted excrescence, apparently forming part of the internode, develops from the node. About 1 in every 50,000 stools was found to be affected by this pathological condition, the cause of which remains to be determined.

D[odds] (H. H.). **Sugar Experiment Station, Mt. Edgecombe. Notes for the month.**—*S. Afr. Sug. J.*, xxi, 1, pp. 17, 19, 21, 1937.

In a series of plots of P.O.J. 2725 sugar-cane the total number of secondary streak [see above, p. 368] infections has increased from

3 to 6 over the past year, the corresponding figure in the Co. 290 plots being from 6 to 14. This rate of infection is extremely slow in view of the total number of stools (480 in the P.O.J. and 576 in Co. 290 series), but it emphasizes the need for the selection of healthy planting material.

Report on the British West Indies Central Sugar-Cane Breeding Station for the year ending September 30th, 1936.—18 pp., 6 diags., [? 1937].

In further work carried out in Barbados on sugar-cane gumming disease [*Bacterium vasculorum*: *R.A.M.*, xv, p. 397] with special reference to the relation between leaf symptoms and systemic infection, the extent of the latter was determined on 20 varieties at five periods by the numbers of gum globules per cane cross-section exuding from the cut ends of cuttings maintained for 24 hours in a moist atmosphere. The results obtained confirmed the conclusion previously reached that, in Barbados, absence or scarcity of leaf symptom development is a true indication of resistance [ibid., xiv, p. 531]. It is now the practice in selection work to eliminate at an early stage in their trials all seedlings showing more than a fixed standard of leaf symptom intensity. In tests of nobilized seedlings the number showing appreciable susceptibility to gumming is stated to be very small.

Pilat (A.). **Additamenta ad floram Sibiriae, Asiae centralis orientalisque mycologicam. Pars quarta.** [Additions to the mycoflora of Siberia and Central and Eastern Asia. Part IV.]—*Bull. Soc. Mycol. Fr.*, lii, 3, pp. 305–336, 7 pl., 5 figs., 1936.

This contribution to the author's series of papers on the fungi of Siberia contains mostly records of Polyporaceae and other Basidiomycetes, with some new species.

Wallace (G. B.). **A revised list of plant diseases in Tanganyika Territory.**—*E. Afr. agric. J.*, ii, 4, pp. 305–310, 1937.

This revised list, arranged in alphabetical order of the hosts, of the diseases of over 80 plants of economic importance in Tanganyika Territory, contains the records made from 1927 to 1936, and with a few additions and amendments combines the lists already published [*R.A.M.*, xiv, p. 746].

Cummins (G. B.). **Descriptions of tropical rusts.**—*Bull. Torrey bot. Cl.*, lxiv, 1, pp. 39–44, 2 figs., 1937.

Descriptions, accompanied where necessary by Latin diagnoses, are given of one new genus (*Lipocystis*, based on *Ravenelia caesalpiniae*), four new species, and two new combinations of tropical rusts.

Ikata (S.). **The function and formation of setae on some anthracnose fungi.**—*Agric. & Hort.*, v, pp. 360–362, 3 figs., 1936. [Japanese. Abs. in *Jap. J. Bot.*, viii, 4, p. (100), 1937.]

On cotton stems and cotyledons heavily infected by *Glomerella gossypii* [*R.A.M.*, xvi, pp. 96, 314] the writer detected the conidial stage, *Colletotrichum gossypii* [ibid., ix, p. 32], showing a profusion of setae, many of which produced conidia at their apices. *Gloeosporium*

kaki, a parasite of persimmon (*Diospyros kaki*), has not been observed to form setae in nature, but these organs were produced on red pepper [*Capsicum annuum*] artificially inoculated with a pure culture of the fungus. The conidial stage [? *Colletotrichum capsici*: ibid., xv, p. 344] of *Glomerella capsici* on red pepper is characterized in nature by copious formation of setae, but in inoculation experiments these bodies were produced under dry but not under moist conditions.

The development of setae would appear from these observations to be largely dependent on such environmental influences as humidity and the nature of the host, and it is therefore probably incorrect to regard them as distinctive features for the purpose of specific determination.

HASHIOKA (Y.). **Matériaux pour la flore des Urédinées de l'Île de Saghaline septentrionale.** [Materials for the flora of the Uredineae of the island of North Saghalien.]—*J. Jap. Bot.*, xii, 12, pp. 882–886, 1936. [Japanese summary.]

A list is given of 29 rusts collected on various hosts (mostly ornamentals) in North Saghalien, Japan, between 1922 and 1933 [cf. *R.A.M.*, xv, p. 828].

HIRATSUKA (N.). **Gymnosporangium of Japan. I. II. III. IV. V.**—*Bot. Mag., Tokyo*, li, 597, pp. 481–484; 598, pp. 549–555; 599, pp. 593–599; 600, pp. 661–668, 1936; 601, pp. 1–8, 1937.

In this monographic study the writer presents the results [some of which have already been noticed] of five years' work at the Tottori Agricultural College on the taxonomy and biology of the Japanese species of *Gymnosporangium* [*R.A.M.*, xv, pp. 609, 828], and of inoculation experiments carried out by G. Yamada at the Morioka College of Agriculture and Forestry. The teleutospores of *G. haraeanum* from *Juniperus chinensis* have been found to produce an abundance of aecidia on quince, *Cydonia* [*Pyrus*] *sinensis*, *P. serotina*, pear, *Chaenomeles* [*japonica* var.] *extus-coccinea* [*P. japonica* var.], and *Photinia laevis* var. *villosa*. Successful results were also obtained in inoculation experiments with *G. miyabei* Yamada & I. Miyake (*Bot. Mag., Tokyo*, xxii, p. 23, 1908) from *Chamaecyparis* [*Thuja*] *pisifera* and its var. *squarrosa* on *Micromeles* [*Pyrus*] *alnifolia*, and with *G. yamadae* from *J. chinensis* [*R.A.M.*, xiv, p. 533] on *Malus* [*P.*] *pumila* var. *domestica*. *G. hemisphaericum*, which is closely related to the foregoing except in the presence of a uredo stage, was first described by Hara in Japanese (*J. For. Soc. Japan*, 419, p. 16, 1917) on *Cornus* [*P.*] *tschonoskii*. Inoculations with the rust from *J. chinensis* gave positive results on *P. tschonoskii* only. Altogether 11 species of *Gymnosporangium* are discussed, with synonomy, habitat, and distribution. Two keys for the identification of the species based on the characters of the teleuto and aecidial stages, respectively, and a bibliography of 117 titles are appended.

GUILLIERMOND (A.). **La classification des levures.** [The classification of the yeasts.]—*Ann. Ferment.*, N.S. (formerly *Ann. Brass. Distill.*), ii, 8, pp. 474–491; 9, pp. 540–551, 21 figs., 2 diags., 1936.

This is a critical review of recent contributions to the classification

of the yeasts, with special reference to the system proposed by Mme Stelling-Dekker [*R.A.M.*, x, p. 692], which the author accepts as generally rational and satisfactory. Certain modifications are necessitated, however, arising partly out of the non-recognition of ascospore conjugation, e.g., in *Saccharomycodes* spp. and *Hansenula saturnus*, and in part out of new observations published since the completion of Mme Stelling-Dekker's investigations. These emendations are incorporated in a table showing the outlines of the revised system.

Corbett (G.). **Tobacco culture in Mauritius.**—95 pp., 4 diags., Tobacco Bd, Port Louis, 1937.

The section of this treatise dealing with diseases (pp. 63–75) comprises notes in popular terms on the etiology and control of black shank (*Phytophthora parasitica*) [*nicotianae*: *R.A.M.*, xv, p. 203], frog eye (*Cercospora nicotianae*), white rust or mildew (*Oidium tabaci*) [*Erysiphe cichoracearum*], damping-off (*Pythium de Baryanum* and *Rhizoctonia* [*Corticium*] *solani*), Granville wilt (*Bacterium solanacearum*), angular leaf spot (*Bact. angulatum*), mosaic [loc. cit.], frenching [ibid., xv, p. 322], and potash deficiency.

Spencer (E. L.). **Frenching of Tobacco and thallium toxicity.**—*Amer. J. Bot.*, xxiv, 1, pp. 16–24, 2 figs., 1937.

In a study made to ascertain whether some toxic inorganic substance present in the soil was the cause of tobacco frenching [see preceding abstract] Turkish tobacco seedlings were germinated and cultured in quartz sand, supplied with a nutrient solution, and submitted to the action of 33 selected elements. Mercury, selenium, iodine, cadmium, cobalt, nickel, and thallium were the only elements found toxic to the seedlings in concentrations as low as 5 parts per million and thallium was the only element tested which at this concentration or less produced chlorosis, strap-shaped leaves, and other symptoms of frenching.

The first visible symptom of thallium toxicity was the yellowish-green colour of the young leaves, which was followed by interveinal chlorosis near the base of the midrib of the tip leaf. Subsequently, the chlorosis extended along the midrib, and then diffused laterally towards the outer margins, until it covered the entire leaf, the dark green veins being easily differentiated. Later, the tip leaves became long and ribbon-shaped. Extreme thallium toxicity led to a restriction of terminal growth, and stimulation of the axillary buds, in which growth in turn became restricted; rosettes of small, chlorotic, strap-shaped leaves developed. These symptoms were very similar to those of natural frenching, except that the chlorosis due to frenching develops first at the base of the tip leaf and then extends along the leaf margins instead of the midrib.

The minimum concentration of thallium that produced chlorosis was 0·067 parts per million in nutrient water cultures, 0·10 p.p.m. in quartz sand cultures, 0·38 p.p.m. in orchard soil (a light, sandy, non-toxic loam) watered weekly with thallous nitrate, and 0·25 p.p.m. in field soil (a heavy clay loam that caused severe frenching) treated similarly.

Equivalent amounts of thallium were more toxic to tobacco seedlings in sand when added with a water extract of the field soil than when added with the orchard-soil extract or water alone. Although the orchard-soil extract is not toxic, the additions of a non-toxic concentration of thallium renders this extract toxic. These results indicate that the additive effect of a non-toxic concentration of thallium supplements the activity of some principle already present in the soil that produces chlorosis, and suggest that it may be thallium.

Tobacco species susceptible to frenching were also sensitive to thallium. Turkish tobacco was extremely sensitive to thallium, while *Nicotiana langsdorffii*, *N. rustica*, and tomato, which show only faint frenching, were less sensitive, and *N. glutinosa* and *N. glauca*, which are apparently not susceptible to frenching, were little affected by doses of thallium highly toxic to Turkish tobacco.

Thallium-induced chlorosis was controlled by the addition of nitrogen salts, a dilute solution of aluminium sulphate, and potassium iodide, all of which prevent frenching.

For the final proof of the identity of frenching with thallium poisoning the presence of thallium in soils which produce frenching requires to be demonstrated, but it is doubtful whether chemical methods are available at present sensitive enough to detect such small traces of the element as employed in the experiments reported.

SCHWEIZER (J.). **Jaarverslag Tabak over Juli 1935 t/m Juni 1936.** [Annual report on Tobacco from July, 1935 to June, 1936.]—*Meded. besoek. Proefst.*, 55, 51 pp., 1936.

The phytopathological section of this report (pp. 37–38) contains the following among other items of interest. Mosaic [see next abstract] was very widespread, causing over 70 per cent. reduction of the crop in certain plantations. 'Kroepoek' and 'krekoh' [leaf curl: loc. cit.] were most in evidence along the edges of trenches, paths, and the like, where the wild hosts, e.g., *Polanisia viscosa*, of the Aleurodid vectors (*Bemisia* sp.) of the disease abound. Native tobacco is another source of infection. A dry spell following the development of *Phytophthora* [*parasitica nicotianae*] in the form of foliar spotting at the commencement of the rains arrested the spread of the disease and facilitated the adoption of preventive measures.

VAN DER WEIJ (H. G.). **Ziekten der Tabak.** *Ex* **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1936.** [Tobacco diseases. *Ex* Survey of the diseases and pests of Deli Tobacco in the year 1936.]—*Meded. Deli-Proefst.*, Ser. II, xcvi, pp. 4–10, 1937.

During 1936 it was necessary to break up 55,406 tobacco seed-beds on account of slime disease (*Bacterium solanacearum*) in the Deli district of Sumatra [*R.A.M.*, xv, pp. 402, 686]. The average incidence of infection in the field amounted to 10·3 per cent., approximately the same as last year. *Bact. pseudozoogloeae* [ibid., xv, p. 749; xvi, p. 214] was responsible for serious damage on a couple of estates. *Phytophthora* [*parasitica*] *nicotianae* [ibid., xv, p. 686] necessitated the breaking-up of 295 seed-beds compared with 109 in 1935, but caused

little trouble in the field. Leaf spot (*Cercospora nicotianae*) [ibid., xv, p. 687] occurred in a virulent form in elevated situations.

There was an appreciable increase in the incidence of mosaic [ibid., xv, p. 686] during the period under review, the plantations reporting 'considerable', 'heavy', and 'very heavy' damage numbering, respectively, 17, 11, and 8 as against 9, 6, and 3 in 1935. 'Gilah' or 'kroepoek' [identical at least in part with leaf curl: ibid., xi, p. 676; xv, pp. 403, 536], which was remarkably prevalent, was effectively combated on one estate by the eradication of weeds on adjacent strips of ground, thereby minimizing the risk of transmission by white flies (Aleurodidae) [see preceding abstract].

Van der Poel (J.). **Verslag van eenige onderzoekingen betreffende de oorzaak der natte koppen.** [Report on some investigations concerning the cause of wet stalks.]—*Meded. Deli-Proefst.*, Ser. II, xcv, 19 pp., 1937. [English summary.]

No pathogenic organisms appear from the preliminary studies herein reported to be involved in the causation of a humid condition of tobacco stems known as 'wet stalks' which occasionally entails heavy losses in the fermented product. A correlation has been established, however, between this defect and the abnormally high potash and low lime contents induced by manuring the crop with tobacco ash.

Thung (T. H.). **Smetstof en plantencel bij enkele virusziekten van de Tabaksplant III.** [Infective principle and plant cell in some virus diseases of the Tobacco plant III.]—*Tijdschr. PlZiekt.*, xliii, 5, pp. 11–32, 5 pl., 1937. [English summary.]

Continuing his studies on the protective action of certain tobacco viruses against others [*R.A.M.*, xv, p. 533], the writer differentiates four types of antagonism between the ordinary, white, and severe mosaics, ring spot necrosis, Vorstenland distorting strain I, and Holmes's distorting strain, viz., an equilibrium, a predominance, a regulable equilibrium, and a partial predominance. An equilibrium is represented by the evenly distributed green and white pattern formed on the young leaves as a result of simultaneous inoculation with severe and white mosaic. Absolute predominance of ordinary mosaic follows the joint inoculation of this virus and white mosaic into the young foliage, the former also gradually assuming the upper hand even when introduced after the latter. It is possible to regulate the proportions of the green and white pattern induced by Holmes's distorting strain and white mosaic. Thus, the inoculation of a young leaf with the former and of the second underlying leaf with the latter results in the formation of large green areas with a few white spots, while a reversal of this mode of procedure leads to the development of more and larger white spots. The inoculation of two successive leaves results in an intermediate pattern. The same proportions will be maintained in the newly developing foliage. When the Vorstenland distorting strain I and white mosaic are simultaneously inoculated, only the symptoms of the latter appear, but if the white mosaic is introduced 24 hours or more after the Vorstenland strain, a mixture will develop in which the shape is conferred by the latter and the colour by the former. This partial

predominance represents a form of equilibrium to which all the younger leaves will adhere. The inoculation of the sap of leaves showing this blend of symptoms into healthy plants produces only the pure white mosaic.

The velocity of the antagonistic action between the viruses under observation, as expressed by the extent of the white areas in the foliage and less conspicuously in the stems, was found to vary, being greatest in Holmes's distorting strain and least in ring spot necrosis. The inoculation of white mosaic into a young leaf and of one of the other viruses into the fifth underlying leaf results at first only in the development of white mosaic in the young foliage and a white discoloration of the stem. The youngest leaves, however, soon show mixed patterns, Holmes's distorting strain acting the most rapidly. When the white mosaic is inoculated into the fifth underlying leaf, the young upper leaf inoculated with the slowly developing ring spot necrosis also shows white spots, but this is not the case when the upper leaf is inoculated with any of the other viruses.

Inoculations were carried out with white mosaic at different sites on the leaves and stem, the results of which showed that rapidity of development of the symptoms increases parallel with the height of insertion of the virus [ibid., xiii, p. 476]. The inoculation of the lower leaves and stem base causes a white discoloration of the stem spreading rapidly downwards but very slowly upwards. New shoots formed on the white parts of the stem are totally infected by white mosaic.

The immunity from other mosaic viruses conferred by white mosaic appears to be conditional on the interval elapsing between the inoculations and on the age of the plants, very young ones being liable to invasion even by a 'weak' virus. Ring spot necrosis is unable to penetrate the mixed pattern of severe and white mosaic, possibly owing to the production of a blocking element by the latter, and this incapacity extends to the relatively 'strong' ordinary mosaic and Holmes's distorting strain. It is apparent from these observations that previous statements as to the immunizing action of a 'weak' virus against a 'strong' one require rectification in the light of newly acquired knowledge as to the influence of the plant cell on the process in question.

Wyckoff (R. W. G.), Biscoe (J.), & Stanley (W. M.). **An ultracentrifugal analysis of the crystalline virus proteins isolated from plants diseased with different strains of Tobacco mosaic virus.**—*J. biol. Chem.*, cxvii, 1, pp. 57–71, 1 diag., 3 graphs, 1937.

A series of ultracentrifugal analyses by the absorption and refractive index methods was made of solutions of the virus proteins derived from plants of different families infected with various strains of tobacco mosaic. The sedimentation constants of these proteins are the largest hitherto found, corresponding to molecules of a weight of several millions (probably in excess of ten) [*R.A.M.*, xvi, p. 212]; in other respects the results obtained are strictly analogous to those given by other large molecules. The constants of these heavy molecules were found to be identical in (1) the untreated juice of diseased plants, (2) solutions of the crystalline mass obtained by centrifuging this juice at

very high speeds, and (3) solutions of the crystalline proteins isolated and purified by chemical methods. Heavy molecules were not found in the juice of healthy plants or in the proteins precipitated therefrom.

The molecular weight of the virus proteins does not change perceptibly within a P_H range of 2 to 9·3. On the acid side of P_H 7 true solubility falls very rapidly with an increase in the hydrogen-ion concentration, most of the protein occurring in the form of colloidal particles with sedimentation constants of the order of 500. In solutions diluted to a concentration of 0·5 mg. protein per c.c. and allowed to stand, unsedimentable material appeared which indicates that under these conditions the large molecules may break up into smaller units.

Differences were detected in the sedimentation rates of different strains of virus proteins (ordinary, aucuba, masked, and 'purified' from a single lesion) and between the proteins obtained at different times from plants inoculated with the ordinary tobacco mosaic virus. Solutions of the virus proteins recovered from tobacco and tomato and from tobacco and phlox plants inoculated with the same strain of mosaic gave identical sedimentation constants.

Treatment of the virus protein with hydrogen peroxide, formaldehyde, or nitrous acid did not disrupt the molecules, but the two latter reagents induced distinct molecular heterogeneity. Some of the virus proteins were molecularly homogeneous, while others showed the broad, diffuse sedimenting boundaries indicative of considerable molecular heterogeneity, and others again, giving double boundaries, contained two well-marked molecular types.

It is apparent from these observations that the virus proteins of the various tobacco mosaic strains consist of a group of related but distinct molecular species. Careful examination has revealed differences in the symptoms evoked in inoculated plants by virus proteins with widely divergent sedimentation constants.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. VIII. The isolation of a crystalline protein possessing the properties of aucuba mosaic virus.**—*J. biol. Chem.*, cxvii, 1, pp. 325–340, 1 fig., 1937.

A crystalline protein with the properties of the aucuba mosaic virus has been isolated from infected Turkish tobacco plants [see preceding abstract]. The virus activity, as judged by half-leaf tests on *Nicotiana glutinosa* and Early Golden Cluster beans (*Phaseolus vulgaris*), chemical composition, optical rotation, crystalline appearance, X-ray diffraction pattern of crystals, and general chemical and serological features of this protein are either identical with, or very similar to, those of the tobacco mosaic virus protein. The aucuba mosaic virus protein is distinguishable from the latter, however, by its larger crystals, more silky and opalescent solutions, lower solubility, more alkaline isoelectric point, and greater sedimentation constant. The isolation from tobacco plants inoculated with aucuba mosaic of a crystalline protein differing from that of tobacco mosaic shows that two distinct strains of a virus give rise to two divergent proteins—a fact considered to be of prime importance as affording at least an indication that viruses may be characterized as separate proteins.

Takahashi (W. N.) & Rawlins (T. E.). **Stream double refraction of preparations of crystalline Tobacco-mosaic protein.**—*Science*, N.S., lxxxv, 2195, pp. 103–104, 1937.

Previous evidence by the authors suggested that tobacco mosaic virus may be composed of submicroscopic rod-shaped particles capable of causing stream double refraction [*R.A.M.*, xiv, p. 521]. Crystal preparations made from infective juice by Stanley's method [see preceding abstracts] (and by a combination of the methods of Vinson and Petre, and Stanley), and colloidal solutions of the preparations containing the crystals, produced stream double refraction. If Stanley's crystal preparations are pure virus, then this virus is capable of causing stream double refraction and, when in colloidal solution, is probably composed of submicroscopic rod-shaped particles. In studies of the relation of hydrogen-ion concentration to intensity of stream double refraction and to active virus concentration it was found that the number of local lesions produced by the virus in *Nicotiana glutinosa* was higher and the stream double refraction lower at P_H 7 than at 5·6, and these relations held for unpurified virus as well as the crystal solutions. Determination of virus concentration by stream double refraction should therefore be carried out at the same P_H as the control. When diluted to the critical dilution (at which stream double refraction becomes undetectable) the solution of Stanley crystals produced 24 per cent. fewer lesions than the unpurified control virus and the crystals obtained by the combined method 57 per cent. less. If one assumes that the crystal preparations are pure virus, it may be deduced from the results obtained that a significant portion of the virus in the crystals is inactive.

Holmes (F. O.). **Genes affecting response of Nicotiana tabacum hybrids to Tobacco-mosaic virus.**—*Science*, N.S., lxxxv, 2195, pp. 104–105, 1937.

The dominant gene for the necrotic type of response to tobacco-mosaic virus, which in a recent communication [*R.A.M.*, xvi, p. 213] was reported to have been transferred from *Nicotiana rustica* to a self-fertile derivative of *N. paniculata* by hybridization of the two species, is now stated to have been carried from the latter to plants of [(*N. paniculata* × *N. tabacum*) × *N. tabacum*] × *N. tabacum*, the back-cross generations showing considerable deviations from 1: 1 ratios of necrotic-type to mottling-type plants. A similar gene for necrotic-type response has also been transferred from *N. glutinosa* to three generations of hybrids with *N. tabacum* through hybridizing the latter with *N. digluta* (a fertile amphidiploid *N. glutinosa–N. tabacum* hybrid); segregation, however, occurred in the subsequent back-cross generation, the mottling type being in excess of expectations. While it is not yet known whether the necrotic type genes of *N. rustica* and *N. glutinosa* can be incorporated in strains of *N. tabacum* or not, the work is being continued because it is believed that tobacco mosaic would be unable to maintain itself in tobacco varieties bearing these genes, and that this disease, now widely prevalent in other crops, e.g., tomatoes and peppers [*Capsicum annuum*], might disappear if the virus reservoir in tobacco were eliminated or considerably reduced.

Jensen (J. H.). **Studies on representative strains of Tobacco-mosaic virus.**—*Phytopathology*, xxvii, 1, pp. 69–84, 7 figs., 1937.

The symptoms induced by 12 tobacco-mosaic virus strains, namely green mottling distorting (Johnson's virus 1), yellow mottling distorting (1010), yellow mottling aucuba (108), green mottling aucuba (501), yellow mottling (302), yellow spotting (111), light green spotting (9), mild yellow spotting (104), non-distorting green mottling (502), masked symptom (Holmes), slow moving yellow spotting (3), and necrotic (14), representative of those caused by 55 strains [*R.A.M.*, xv, p. 533], on Turkish tobacco, *Nicotiana sylvestris*, and *N. glutinosa* are described. The slow-moving, necrotic strain (No. 14) killed tomato plants in inoculation experiments. Exceptionally small lesions were produced on *N. glutinosa* by two of the strains (No. 104 and masked symptom). Single pin-puncture inoculations of certain strains (Johnson No. 1 and 104) on young tobacco plants resulted in up to 50 per cent. infection, whereas other strains (111, 3, and 14) were transmitted in less than 1 per cent. of the trials and a further number were intermediate between these extremes. Similar results were given by infectivity tests with the local-lesion method. All the strains tested withstood ten-minute exposures to a temperature of 80° C.

Chamberlain (E. E.). & Clark (P. J.). **Nicotine content of Tobacco.**—*N.Z. J. Sci. Tech.*, xviii, 8, pp. 628–637, 3 figs., 1937.

Mosaic was found to cause a marked reduction in the nicotine content of tobacco [*R.A.M.*, x, p. 411] in New Zealand, more especially when infection occurs at an early stage of growth. In the inoculation experiments herein described the reduction was more severe on *Nicotiana rustica* than on the commercial varieties (Turkestan, White Stem Orinoco, Latikia, Warne, and Chloe) of *N. tabacum* tested.

Smith (K. M.). **Studies on a virus found in the roots of certain normal-looking plants.**—*Parasitology*, xxix, 1, pp. 70–85, 2 pl., 1 fig., 1937.

Continuing his studies of tobacco necrosis [*R.A.M.*, xiv, p. 797; xv, p. 107], the author found that the infective principle occurs not only in the roots of tobacco and *Nicotiana glutinosa*, but also in those of *N. langsdorffii*, tomatoes, *S. nigrum*, *Polyanthus* sp., *Primula obconica*, asters, zonal pelargonium [*Pelargonium zonale*], and French beans [*Phaseolus vulgaris*]. None of these hosts, with the exception of the two first-named, showed external symptoms of infection, but severe although localized necrotic spots could, in many species, be produced by inoculating the leaves with the virus obtained from the roots of the same plant. It was experimentally demonstrated that the roots of tobacco plants, which first gave a negative virus reaction, may contain the principle a few weeks later, as well as the roots of tobacco plants raised from seed which had been heated to a temperature of 75° C. for 10 minutes. Exposure of infected root tissue to this temperature for a similar period, however, inactivated the virus or reduced it to a trace when present in high concentration. All attempts to demonstrate the presence of the virus in the seeds of the various hosts proved negative. There appears to be a wide range of plants which are susceptible to local infection in the leaves by artificial inoculation, since

in a preliminary series of tests lesions were thus produced on about 25 species belonging to ten families.

In considering explanations of the origin and spread of the virus, the author suggests, in view of the strong evidence against the possibility of seed transmission and other modes of dissemination common to most plant viruses, that the infective agent may be, not perhaps a normal constituent of plant roots, but a substance or entity easily produced under certain abnormal conditions, the more so that the disease seems in some way to be connected with glasshouse environment.

Smith (K. M.). **Further studies on a virus found in the roots of certain normal-looking plants.**—*Parasitology*, xxix, 1, pp. 86–95, 1 pl., 1937.

In the experiments described in this paper it was shown that the roots of tobacco plants raised and grown under aseptic conditions do not contain the necrosis virus which is commonly present in the roots of a number of different plants in greenhouses in Cambridge [see preceding abstract]. It was further experimentally established that the disease is not seed-borne, and that the virus enters the plants from some external source, which in the tests was traced to the sludge at the bottom of the water tanks, whence it was carried to the roots with water; no evidence has so far been obtained that infection may be air-borne. Further tests, performed on French beans (*Phaseolus vulgaris*), which are highly susceptible to artificial inoculation, indicated that the virus may be completely desiccated over sulphuric acid and still retain undiminished infective powers for long periods; so far as tested, it remained infective for six months when stored in absolute alcohol at laboratory temperatures. While in extracted plant sap its thermal death point is only about 72° C., it was not completely inactivated by subjecting it for 15 minutes to 100° dry heat. The suggestion is made that the infective principle may be a transitional stage between a pathogenic and a non-pathogenic substance.

Miller (J. H.) & Crosier (W. F.). **Pathogenic associates of Tomato seed: their prevalence, relation to field disease and elimination.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1936*, pp. 108–111, 1936.

Seed transmission of tomato pathogens was recently emphasized by disastrous outbreaks in the United States of early blight [*Alternaria solani*: *R.A.M.*, xvi, p. 301], bacterial canker [*Aplanobacter michiganense*: ibid., xvi, p. 214], and collar rot [(?) *A. solani* and other fungi: ibid., xv, p. 633], and evidence obtained in 1935 strongly supported the view that commercial seeds were the chief source of primary infection. Examination of 468 samples of seed received at the Georgia laboratory showed that the organisms most commonly present were *A. solani*, *Bacterium vesicatorium* [ibid., xvi, p. 302] and *Aplanobacter michiganense*; *Colletotrichum phomoides* [ibid., xvi, p. 70], *Phoma destructiva* [ibid., xvi, p. 302], and *Fusarium* [*bulbigenum* var.] *lycopersici* [ibid., xv, pp. 537, 615] were noted occasionally.

Many species of *Alternaria* occur on tomato seed as saprophytes or very weak parasites. It was found that not only do seeds carry *A. solani*, but that other Solanaceous plants and soil debris were not

responsible in Georgia in 1936 for overwintering of the fungus and the initiation of primary seedling infections. When clean seeds were planted in two fields severely blighted the previous year, no sign of *A. solani* appeared. Taking an average of all the tests, 1·84 per cent. out of 14,869 untreated tomato seeds were infected by *A. solani*. This figure was reduced to 1·446 per cent. of 70,342 and 1·01 per cent. of 53,433 once- and twice-treated seeds, respectively, this being evidence that both internal and external seed carriage occur in commercial seedstocks. One lot of twice-treated seed showed 1·57 per cent. of *A. solani* in plates, and produced heavy infection on virgin land, though seed showing no infection in plates also showed none in the field, in old or new land.

Bact. vesicatorium and *A. michiganense* were repeatedly obtained in pure culture from commercial seed. One- and two-seed treatments with mercuric chloride reduced infection by *Bact. vesicatorium* from 1·34 per cent. in the untreated controls to 0·872 and 0·389 per cent. respectively; the corresponding percentages for *A. michiganense* being 0·023, 0·0159, and (for twice-treated seeds of other seed stocks) 0·0658.

Wilson (J. D.) & Runnels (H. A.). **Five years of Tomato spraying.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 184, pp. 13–18, 1937.

In four out of the five years (1932 to 1936) covered by the writers' spraying experiments against foliar diseases of tomatoes in Ohio, Bordeaux mixture at varying concentrations decreased the yield of the treated plants as compared with the controls [*R.A.M.*, xii, p. 459]. During these seasons disease was negligible or absent. In 1935 considerable defoliation was caused by early blight (*Macrosporium* [*Alternaria*] *solani*) [see preceding abstract], and in the summer of that year the yields were increased from 630 lb. in the untreated plot to 680 lb. and 699 lb. in plots sprayed with 4–4–50 Bordeaux mixture and copper oxychloride plus wyojel [*R.A.M.*, xvi, p. 197] 4–4–50, respectively, the former giving excellent, and the latter fairly good, control of the disease. In 1934 the addition of Volck oil emulsion (1 in 100) to Bordeaux mixture lessened both the excessive transpiration due to the latter and the resultant reduction of yield. A Bordeaux formula with a high hydrated lime and a low copper sulphate content was usually more injurious to the plants than one in which the proportions were reversed. Other copper-containing compounds of low solubility, e.g., copper oxychloride and coposil [ibid., xv, p. 706], caused smaller reductions in yield than Bordeaux mixture. In each of the three seasons when blossom-end rot [ibid., xvi, p. 302] was important, its incidence was increased by Bordeaux mixture and reduced by the oil emulsion.

Henrick (J. O.). **Blossom-end rot of Tomatoes.**—*Tasm. J. Agric.*, N.S., viii, 1, pp. 33–34, 1 fig., 1937.

On three occasions during the past three or four seasons tomatoes grown in glasshouses in Tasmania have been severely affected by the physiological disorder known as blossom-end rot [see preceding and next abstracts]. Control depends upon very careful and constant

attention to watering (followed on each occasion by surface cultivation to conserve moisture and promote root growth), the accurate adjustment of temperature (65° gradually rising to 75° F. in the younger and fruiting stages, respectively), and improved ventilation.

ROBBINS (W. R.). **Relation of nutrient salt concentration to growth of the Tomato and to the incidence of blossom-end rot of the fruit.** —*Plant Physiol.*, xii, 1, pp. 21–50, 7 figs., 1 graph, 1937.

A detailed account is given of experiments in which tomato plants from a selected strain of the Marglobe variety were grown in sand and watered with solutions of nutrient salts adjusted to concentrations corresponding to five different osmotic pressures, namely, 0·08, 0·44, 0·83, 1·7, and 3·1 atmospheres; two variants were made of the tests with the solution of the lowest concentration, in the first of which the solution was supplied at the rate of 1 l., and in the second at the rate of 4 l. per plant. The results showed, *inter alia*, the dependence of the plant upon abundant water supplies for rapid growth and fruit development. Solutions of low concentration facilitated growth, but in solutions of high salt concentration growth may be limited through lack of water.

No blossom-end rot of the fruit [see preceding abstracts] occurred in the plants grown with the solution of the lowest concentration, whereas nearly 80 per cent. of the fruits in the series with the two highest concentrations showed the trouble, the development of which was associated with wide fluctuations in the rates of transpiration and occurred during periods of high transpiration intensities. In the case of the plants in the lowest concentration series a slight amount of cracking of the fruit occurred under conditions of low transpiration intensity. Special tests revealed a difference of about four atmospheres between the osmotic values of the extracted juices of similar tissues of plants grown with solutions of the lowest and highest concentrations (6·68 to 10·79, and 8·19 to 12·99 atmospheres in the case of the fruits and stems, respectively). An osmotic gradient of 1·62 to 3·63 atmospheres was determined between the extracted juices of the fruits and those from the stems and leaves, the smallest gradient occurring in the plants in the lowest concentration series. The bearing of these findings, as well as that of modifying factors, on the development of blossom-end rot is briefly discussed, and the author concludes that any factor seriously restricting the rate of absorption of water, or greatly increasing the transpiration, will favour the development of blossom-end rot.

WALTON (C. L.). **The cause of a 'spotting' of Tomato fruits (stigmonose).** —*Gdnrs' Chron.*, ci, 2610, pp. 12–14, 2 figs., 1937.

A disorder of glasshouse tomatoes in Somerset designated 'stigmonose' or 'halo spot' and characterized by the development, mostly near the base of the fruits, of well-defined spots each with a puncture-like central marking, frequently showing a slight nipple-like projection, was experimentally shown to be due to the action of sunlight on water droplets of the fruits, and to be preventable by the provision of adequate shading to retard the desiccation of the moisture.

Gigante (R.). **Una nuova malattia del Pomodoro.** [A new Tomato disease.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 3, pp. 183–198, 1 pl., 14 figs., 1936.

In 1935 and 1936 the author received diseased tomato material from Sicily the leaves of which showed light green, later yellowish spots between the main veins or scattered irregularly over the surface, and sometimes slight wrinkling. In a more advanced stage of the condition dark greenish-grey or brownish-grey areas became visible on the upper surfaces of the leaves, ranging in size from small spots to areas covering a large part of the leaf. Sometimes they were concentrated toward the apex, at others toward the base, and not infrequently they ran along either or both of the leaf edges. In the final stages, the discoloured areas appeared on the under surface as brownish lesions. No symptoms were apparent on the stem or leaf stalks.

The fruits showed pink, greenish-yellow or greenish, irregularly scattered spots 4 to 15 mm. in diameter, or small, round, or irregularly-shaped, yellowish spots, either scattered over the whole surface or confined to one part. As a rule the affected fruits shrivelled up completely, long before normal ones.

Histological examination showed that the leaf lesions consisted of dead cells; the epidermal cells were flattened and the palisade cells shortened, resulting in a reduction of leaf thickness from 140 to 270 μ in the normal, to 50 to 140 μ in the affected part. The condition produced leptonecrosis and in the fruits necrosis of the vascular bundles was noted.

All attempts at transmission by juice inoculations or by seed gave negative results, but infection was successfully transmitted in two out of five cases by grafting a branch from a diseased on to a healthy plant. It is concluded that the disease belongs to the virus group.

Suliotis (M.). **Contributi alla patologia dei Pioppi. IV. Un dissecamento di piantine di Pioppo canadese e P. caroliniano intorno a Physalospora populina Maubl. ed una Phoma sp.** [Contributions to the pathology of Poplars. IV. A withering of Canadian and Carolina Poplar seedlings associated with *Physalospora populina* Maubl. and a *Phoma* sp.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 5–6, pp. 62–72, 2 pl., 6 figs., 1936.

In April, 1936, Carolina and Canadian poplar [*Populus carolinensis* and *P. canadensis*] seedlings in an Italian nursery were affected by a discoloration and drying up of the bark which began near the top of the trunk and rapidly spread downwards; the wood under the affected parts showed dark streaks or was chestnut-coloured, and where the bark had quite dried up was grey, light, and spongy. The bark bore perithecia of *Physalospora populina*, together with pycnidia of a species of *Phoma*, 150 to 280 μ in diameter, containing elliptical or ovoid, smooth pycnospores, 5 to 5·7 by 3 to 3·5 μ. The *Phoma* appeared to be identical with that recorded by Maublanc in 1907 as the imperfect stage of *Physalospora populina*.

In cultures on bark decoction agar the ascospores of *P. populina* developed a greyish mycelium with round piriform perithecia, which

after three months were still immature, and subglobose to irregular sclerotia, 300 to 500 μ in diameter. No pycnidia were observed. The *Phoma* pycnospores produced on the same medium and on Richards's agar a macroscopically identical colony with that of *Physalospora populina* but formed true pycnidia after four months; sclerotia were produced after 25 days. Subsequent transfers gave abundant pycnidia which, like the spores, were identical with those observed in nature and generally arranged in irregular masses of 3 to 20. Repeated inoculations of a healthy Canadian poplar seedling with both organisms gave negative results. The author agrees with Maublanc that the organisms are genetically connected and considers they may perhaps be parasitic. Further investigations are to be made.

Goidànich (G.). **Morfologia, biologia e sistematica di un fungo parassita delle foglie di Pioppo (Stigmina radiosa (Lib.) G. Goid.).** [Morphology, biology, and taxonomy of a fungus parasitic on Poplar leaves (*Stigmina radiosa* (Lib.) G. Goid.).]—Reprinted from *Ann. Bot., Roma,* xxi, 2, 12 pp., 5 figs., 1936.

An account is given of the morphology, systematic position, and biology of the leaf parasite of *Populus canadensis* previously known as *Fusicladium radiosum* [*Venturia tremulae*: *R.A.M.*, xi, p. 136] but renamed by the author *Stigmina radiosa* [ibid., xvi, p. 71]. The fungus forms a loose subepidermal stroma, and the hyphae emit laterally cone-shaped, later nearly oval protuberances, 15 μ long, each of which is cut off by a basal septum and develops into a conidium, two further cross septa being formed. The conidia are oval, smooth, markedly constricted at the septa, 21 to 37 by 8·5 to 14 μ in diameter, and germinate by the emission of a germ-tube from one of the two lateral cells.

The author considers that the fungus is not a *Fusicladium,* as it does not possess true conidiophores, and transfers it to *Stigmina* as *S. radiosa* (Lib.) G. Goid. because in this genus of leaf parasites the conidiophores are very short or non-existent. Synonyms of the fungus include *Oidium radiosum* Lib., *Napicladium tremulae, Fusicladium asteroma,* and *Fusariella populi.*

The fungus also attacks *P. nigra, P. tremula,* and *P. alba,* and has been found in France, Denmark, Germany, and Russia. In Italy it occurs in Venetia, Lombardy, Piedmont, Liguria, Emilia, and Tuscany. It is a true parasite, though infection is favoured by humid conditions.

Viennot-Bourgin (G.). **Contribution a l'étude de la flore cryptogamique du bassin de la Seine (11ᵉ note). Deux Urédinées nouvelles.** [A contribution to the study of the cryptogamic flora of the Seine basin (11th note). Two new Uredineae.]—*Rev. Path. vég.*, xxiv, 1, pp. 78–85, 2 pl., 1937.

Descriptions are given of two new rusts found in the vicinity of the Seine. *Puccinia loliicola* n.sp. occurred in the uredo and teleuto stages on *Lolium perenne* and *L. italicum.* The uredosori are confined to the leaves, on the upper and lower surfaces of which they appear in a discoloured epidermal zone; they are linear in shape, measuring 0·5 to 2 mm. in length, and are never confluent or in series. The epiphyllous, occasionally hypophyllous, round, or angular teleutosori are also con-

fined to the leaves, and measure 0·4 to 1 mm. in length. The paraphyses are claviform or, usually, widely thickened at the tip, and divide the sori into ovoid compartments. The species differs from *P. glumarum* in the arrangement and dimensions of the sori, the presence of orange uredosori, and in the grouping of the paraphyses. *Melampsora allii-populina* Kleb. *muscaridis-populina* f. nov. was found in the *Caeoma* form on *Muscari comosum* Mill. and (following inoculation) on *Allium sphaerocephalum*, and in the uredo and teleuto stages on *Populus nigra*. The new variety differs from *M. allii-populina* [*R.A.M.*, xv, p. 683] in the nature of the echinulations and the dimensions of the teleutospores which measure 28 to 54 by 14 to 21 μ, and are usually smaller than those of *M. allii-populina*.

DOMINIK (T.). **Spostrzeżenia i rozważania nad holenderską chorobą Wiązów powodowaną przez Graphium ulmi Schwarz.** [Some observations on the Dutch Elm disease caused by *Graphium ulmi* Schwarz.]—*Roczn. Nauk rol.*, xxxviii, 1, pp. 134–140, 3 pl., 1937 [French summary.]

The writer discusses the relations between the various climatic conditions prevailing in different parts of Europe and the acute or chronic development of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*), with special reference to the Paris basin and western Poland [*R.A.M.*, xv, p. 407], the general conclusion being reached that violent attacks are to be expected in western Europe while in western Poland a mild form is nearly always assumed. Brown streaks in the wood of diseased trees are not considered to be a reliable diagnostic feature and must be confirmed by isolation of the fungus in pure culture. In the writer's opinion the extensive distribution of the disease throughout Europe entirely precludes any effective measures of control.

SOLOVYEV [SOLOVIEFF] (F. A.). Болезни и повреждения Пробкового Дуба, произрастающего на Кавказе. [Diseases and injuries to which the Cork Oak is subject in the Caucasus.]—*Mitt. forsttech. Akad. Leningr., 1936*, 47, pp. 39–80, 8 figs., 1936. [German and English summaries.]

A phytopathological survey in 1934 showed that cork oaks (*Quercus suber* and *Q. occidentalis*) in the Caucasus suffer considerable damage from ink disease, especially on exposed northern slopes and on poorly drained, clay soils. The disease is characterized by the formation of brownish-black, shiny, diffuse spots on the bark, due to the drying up and oxidation of the exuded sap. These spots occur mostly at the lower part of the trunk, more rarely on the twigs of the crown. In heavy infections the leaves assume a pale green colour and wither, the twigs die back, and finally the tree succumbs. While the etiology of the disease still remains to be elucidated, it is stated that numerous fructifications of a fungus identified as *Endothia parasitica* [*R.A.M.*, xv, p. 692] were found on the branches and twigs of oaks that had been killed by the disease, a fact which requires further investigation. [No description of the fungus is given.] The economic importance of the ink disease may be gauged from the fact that in three localities the incidence varied from 24 to 65·5 per cent. of the trees, many of which

were dead. Trunk rots are also widespread [ibid., xvi, p. 4], chiefly owing to the defective methods used in barking the trees; among the fungi responsible for them special mention is made of *Stereum hirsutum*, which is stated to be the predominant species, *S. subcostatum*, *Polyporus cuticularis*, *P. giganteus* [ibid., xi, p. 680], *Daedalea quercina*, and *Fomes fomentarius*. *Vuilleminia* [*Corticium*] *comedens* is fairly frequent on dying and dead branches and twigs. In certain localities the acorns were found to be largely attacked and mummified by *Sclerotinia pseudotuberosa* [ibid., xv, p. 616]; stored acorns are often affected by moulds, among which species of *Penicillium* and *Aspergillus* are prevalent. Rather frequent is a condition of the bark in which the inner layers of the cortex become abnormally water-soaked and assume a dark discoloration; the presence of a mycelium in the bark suggests that the disease is of fungal origin. Some recommendations are made for the surgical and antiseptic treatment of diseased groves.

MILLER (P. W.). **Sixth Report of progress on Walnut blight and its control in Oregon.**—*Rep. Ore. St. hort. Soc., 1936*, pp. 134–151, 1937.

Further studies on the control of walnut blight (*Phytomonas* [*Bacterium*] *juglandis*) [*R.A.M.*, xiv, p. 477] in Oregon showed that where frequent, prolonged rains occurred during the critical period for infection three applications of Bordeaux mixture in the early pre-blossom stage, late pre-blossom stage, and immediately after blossoming reduced infection to an insignificant amount, control being obtained under less severe conditions by the two last applications only. Bordeaux mixture 2–2–50 was practically as effective as higher concentrations, but the evidence showed that lower concentrations are ineffective in epidemic outbreaks. Dusts were less satisfactory than the 2–2–50 spray, and are not recommended. The spraying did not interfere significantly with the setting of the nuts, but in many cases injured the young leaves especially when high concentrations (e.g. 4–4–50) were used. In general, the higher the temperature at the time of spraying the greater was the resultant injury. Foliage injury was appreciably reduced by the addition to the spray mixture of fish or mineral oil (1 pint per 100 galls.).

MILLER (P. W.). **Current studies on the bacterial blight disease of Filberts and its control.**—*Rep. Ore. St. hort. Soc., 1936*, pp. 152–159, 1937.

Further studies in Oregon of filbert [*Corylus avellana*] blight (*Phytomonas* sp.) [? *Bacterium juglandis*: *R.A.M.*, xv, p. 617] showed that during 1936 the disease was very prevalent and destructive in the Pacific Northwest, probably owing to frequent, prolonged rains during the critical infection period and low temperatures early in the preceding November. The fruits were found attacked for the first time, but the direct crop loss was small as the lesions were mostly confined to the shell; the indirect loss from the killing of pistillate flower buds, and nut-bearing shoots and branches was, however, considerable.

Two critical infection periods occur, in the autumn or early winter, and again in early spring, the former being apparently the more

favourable to infection. In 1936 the disease reached its peak in the latter part of May, development being largely over by midsummer.

COLE (J. R.) & LARGE (J. R.). **Low lime Bordeaux mixture, copper sulphate solution, and copper sulphate solution plus summer oil emulsion as sprays used for the control of Pecan scab.**—*Proc. S.-E. Pecan Grs' Ass.*, xxx (*1936*), pp. 10, 11, 13–18, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvi, 3, p. 352, 1937.]

Good control of pecan [*Carya pecan*] scab [*Cladosporium effusum*] in the south-eastern United States [*R.A.M.*, xiii, p. 812] was obtained in 1935 by one to two pre-pollination applications of a weak, low-lime Bordeaux mixture (2–0·5–50), followed by the scheduled number of cover sprays consisting of 2–0·5–50 or 3–1–50 Bordeaux or copper sulphate (1 lb. to 50 galls.) plus 1 qt. summer oil emulsion.

PLAKIDAS (A. G.). **Diseases of Tung trees in Louisiana.**—*Bull. La Univ.* 282, 11 pp., 6 figs., 1937.

Brief notes are given on the diseases of tung trees [*Aleurites fordii* and *A. montana*] in Louisiana. Bacterial leaf spot (*Bacterium aleuritidis*) [*R.A.M.*, xii, p. 130], observed in 1935, is characterized by angular, dark brown to nearly black spots on the upper leaf surface, which appear light brown on the under surface. The centre is usually lighter than the border, and a wide, yellowish halo is present. The spots may coalesce. Nut rot, caused by a species of *Dothiorella*, probably *D.* (*Botryosphaeria*) *ribis* [ibid., xvi, p. 335], causes the nuts to turn brown and fall prematurely or become mummified. Branch and twig cankers, also caused by a species of *Dothiorella* (*Botryosphaeria*), occur on older branches and young shoots, the fungus in the former type of injury being apparently a secondary invader of wounds.

Crown girdle, apparently the same as that affecting pears [ibid., xv, p. 514], causes yellowing and wilting of the foliage in late summer, the bark and cambium of the trunk at the crown being killed. A canker extends to 10 in. or more above the ground and below to the main roots. Later, the main roots become affected. Plaques of white mycelium usually occur between the killed bark and the underlying wood, and between the layers of the bark. A species of *Botryosphaeria* is constantly associated with the disease, other fungi frequently isolated being *Cephalosporium* sp., *Diplodia* sp., and *Clitocybe* sp. The fungi are thought to gain entrance through frost injuries.

Interveinal browning, characterized by regularly arranged spots between the larger veins of the leaves, is apparently non-parasitic in origin; it is common but only of minor economic importance. In its mild form the disorder is limited to the upper leaf surface, but in its severe form it extends to the lower surface, the brown tissue in the older spots being necrotic. 'Translucent' spot at first appears as a roughening on the under epidermis of the leaves, the spots showing as irregular, ashen-grey, raised patches which coalesce and cover 90 per cent. of the under surface; invisible on the upper surface, they can be seen through it when the leaf is held against the light. Later, brown necrotic spots appear, at first pin-point in size, but enlarging and becoming visible on the upper surface. The disease is unimportant and

thought to be non-parasitic. In the trouble known as 'white tree' the trees are stunted, and the leaves about one-eighth of normal size, erect, and with margins that cup upwards. The under leaf surface is pubescent and whitish, while the upper shows irregular brown spots or patches usually following the veins. The bark is light-coloured, and the trees either do not set fruit at all, or if they do, the nuts do not fill well. The cause of the condition has not been ascertained.

BECKER-DILLINGEN (J.). **Die Gelbspitzigkeit der Kiefer, eine Magnesia-Mangelerscheinung.** [Yellow tip of the Pine, a magnesia deficiency phenomenon.]—*Ernähr. Pfl.*, xxxiii, 1, pp. 1–7, 1 col. pl., 8 figs., 1937. [English and Spanish summaries on pp. 19–20.]

A particularly serious form of chlorosis of pines expressed by yellowing of the needle tips is caused by magnesium deficiency, and may be controlled, as shown by recent experiments on a poor diluvial sand in the Uckermark district of the Province of Brandenburg, by the application to the affected stands of potash magnesia at the rate of 180 lb. per acre.

HIRT (R. R.). **The possibility of Ribes infection by aeciospores of Cronartium ribicola at temperatures above 19° C.**—*Phytopathology*, xxvii, 1, pp. 104–106, 1937.

Aecidiospores of *Cronartium ribicola* from *Pinus strobus* in New York [see above, p. 357] were experimentally shown to be capable of 31 per cent. germination at a maximum temperature of 28° C., the corresponding figure at the optimum of 11° to 12° being 83 per cent. The capacity of the rust for germination at a relatively high temperature may be of importance in connexion with *Ribes* infection in the newly invaded regions.

NAZAROVA (Mme E. S.). Болезнь Сосен, вызываемая **Sclerophoma pithyophila v. H.** [Pine disease caused by *Sclerophoma pithyophila* v. H.]—*Bull. Acad. Sci. U.S.S.R., Sér. biol., 1936*, 6, pp. 1191–1208, 11 figs., 1936. [English summary.]

This report embodies the results of the author's studies during three consecutive years of a diseased condition of pines [species not mentioned] in the neighbourhood of Moscow, characterized both by a die-back of the apical shoots and lateral twigs, and the formation of numerous witches' brooms in the crowns of the trees, the affected trees ranging in age from 10 to 70 years. Pycnidia of *Sclerophoma pithyophila* [*R.A.M.*, xii, p. 790] were consistently present on affected needles and bark, and affected tissues of the needles and shoots (including the witches' brooms) were found to contain a mycelium of the fungus which, on isolation in pure culture, yielded three distinct strains differing slightly in morphological and cultural features. It was shown experimentally that the fungus is pathogenic to pines, its entry being chiefly effected through wounds, although it can also penetrate the unwounded surface of shoots growing very slowly. Histological studies of the witches' brooms showed that the fungus causes hypertrophy of the cells of the medullary rays, enlargement of the parenchyma, and distortion and disorientation of the tracheids and of

the cambium. The fungus is destructive to lignin and owing to this fact, as well as to its capacity to cause blue stain of the wood, the timber from diseased trees cannot be recommended as first-class building material.

CHILDS (T. W.). **Variability of Polyporus schweinitzii in culture.**—*Phytopathology*, xxvii, 1, pp. 29–50, 3 figs., 1937.

Cultural studies of 50 mycelia of *Polyporus schweinitzii* [*R.A.M.*, xvi, p. 358] from various coniferous hosts in widely separated localities throughout the Northern Hemisphere (*Pinus strobus* in the eastern United States and Canada, *P. sylvestris* in Germany, Norway, and Great Britain, *P. rigida* in the United States, *Picea canadensis* in Canada, *P. sitchensis* in Canada and Germany, *Larix europea* in Sweden, *L. laricina* in the United States, *Thuja plicata* in Canada, and unspecified trees in Canada and Japan) showed the fungus to be composed of individuals differing considerably in cultural characters, sporophore production, growth rate on nutrient agar, acidity reactions, and apparently also in the capacity for causing decay in white pine wood. Individual differences were also observed between monosporous mycelia arising from spores produced by pure cultures on malt extract agar. There was no evidence of local or host-specialized strains within the fungus, the serious damage caused by which to planted white pines in New York is therefore probably attributable to site conditions rather than to any extraordinary virulence on the part of the organism in these plantings. The differences shown to exist between individual strains of *Polyporus schweinitzii* are comparable to those demonstrated by Miss Mounce for *Fomes pinicola* [ibid., viii, p. 690], and indicate that research on such variable species involves the study of a large number of individuals if generally applicable results are to be obtained.

FINDLAY (W. K. P.). **Further tests on chemical treatments for the control of sap stain.**—*Timb. News Sawm. Chron.*, xlv, 2035, pp. 566, 568, 1937.

The outcome of tests at the Forest Products Research Laboratory on the chemical disinfection of Scots pine [*Pinus sylvestris*] timber against blue stain and mould [*R.A.M.*, xvi, p. 290] denoted that absolutely clean sapwood may be secured by dipping the boards, after sawing, in an effective fungicide, such as L.E. 5 (0·25 per cent.), lignasan (0·25 per cent.) [ibid., xv, p. 281], or dowicide P. (1 per cent.) [ibid., xiv, p. 729], of which the first-named, a miscible oil, used in the form of an emulsion, is particularly easy and convenient to apply. Reasonable provision for drying and ventilation should be made during the period of stacking in the open.

VANINE (S. I.). Влияние начальных стадий гнили на пропитку древесины антисептиками. [Effect of the first stages of decay on the impregnation of timber with antiseptics.]—*Mitt. forsttech. Akad. Leningr., 1936*, 47, pp. 22–38, 7 figs., 1936. [German and English summaries.]

A tabulated account is given of experiments on the impregnation of timber showing initial stages of rotting, using samples 15 by 3 by 3 cm.

Pine timber showing the first symptoms of decay caused by species of *Stereum* and *Corticium* may be treated with mineral and oil antiseptics in the same way and as effectively as sound timber. Spruce wood in the first stage of rot caused by *Trametes abietis* [*R.A.M.*, xiii, p. 604] is much more readily penetrated by a mixture of creosote with a black mineral oil than sound wood, and in the initial, brown stage of the rot caused by *Peniophora gigantea* [ibid., xiv, p. 270] it absorbs this mixture a little better than healthy wood. This preparation, however, penetrates greyish-brown discoloured maple wood attacked by *Fomes connatus* [ibid., xv, p. 66] much less satisfactorily than sound material. Blue staining of timber [*Ceratostomella* spp.] was found not to interfere with the capacity of the timber to absorb either mineral or oil antiseptics.

Burgwitz (G. K.) & Nazarova (Mme E. S.). О действии инфракрасных лучей на грибки, разрушающие древесину. [The action of infra-red rays on wood-destroying fungi.]—*Bull. Acad. Sci. U.S.S.R., Sér. biol., 1936*, 6, pp. 1173–1190, 1 graph, 1936. [German summary.]

In experiments on the action of infra-red rays [*R.A.M.*, xv, p. 624], either direct or through wood screens (1·8 to 3·6 cm. thick), on pure cultures of *Merulius lacrymans* and *Poria vaporaria*, the temperature at the surface of the cultures during irradiation being regulated at different degrees by means of artificial ventilation, it was found that the growth of both fungi was stimulated by direct irradiation for from 5 to 15 minutes at 30° C., but was depressed after one hour; depression also followed after 5 minutes' irradiation, when the temperature was allowed to rise to 59°. Death of the *P. vaporaria* cultures ensued after 5 minutes' direct irradiation at 69°, and of *M. lacrymans* at 80°. There was evidence that the growth-retarding or lethal effect of the rays is not due to their heating properties alone, but that they also exert a specific, electromagnetic action on the fungi. This specific action of the infra-red rays was considerably reduced when wood screens were interposed, the observed growth-retarding effects of the irradiations in these cases being chiefly attributed to heat waves, which after a certain time were emitted by the irradiated screens.

Wooley (J. C.). **Effect of treatment on fence posts.** *Bull. Mo. agric. Exp. Sta.* 374, 12 pp., 1 fig., 2 diags., 1 graph, 1937.

Further studies on the effect of various preservative treatments on fence posts in Missouri [*R.A.M.*, xii, p. 1] indicate that, taking $1\frac{3}{4}$ cents as the maximum post year cost (first cost plus cost of treatment/years of service) allowable, only a limited number of timbers and methods are economically feasible. White walnut [*Juglans cinerea*], white elm [*Ulmus americana*], and honey locust [*Gleditsia triacanthos*] should be painted with hot carbolineum, which also enhances the durability of white oak [*Quercus alba*] and *Sassafras*, though not indispensable for the two last-named. Osage orange [*Maclura aurantiaca*], *Catalpa catalpa*, white cedar [*Thuja occidentalis*], and black locust [*Robinia pseudacacia*] can safely be employed for the purpose in view without treatment. Submerging butts in hot creosote (for 1 or $2\frac{1}{2}$ hrs.) and then in cold (for similar periods) gave the greatest percentage gain in service, but the cost per post year was too high to be economical.

Standard specifications for creosote. A.S.T.M. Designation: D390–36. Standard specifications for creosote coal-tar solution. A.S.T.M. Designation: D391–36.—*A.S.T.M. Stand.*, *1936*, 2, pp. 527–530, 1936. [Abs. in *Build. Sci. Abstr.*, N.S., x, 1, p. 22, 1937.]

It is laid down by the American Society for Testing Materials that creosote for use in the preservative treatment of timber shall be a distillate of coal gas or coke over tar conforming to the following requirements: water content not to exceed 3 per cent.; matter insoluble in benzol not more than 0·5 per cent.; specific gravity 38° C./15·5° C. not less than 1·03; distillation, based on water-free oil, up to 210° C. not more than 5 per cent., and up to 235° C. not more than 25 per cent.; and coke residue not more than 2 per cent.

Creosote coal-tar solution for the same purpose shall be a product of which at least 80 per cent. shall be a distillate of coal gas or coke oven tar conforming to the following requirements: water not to exceed 3 per cent.; matter insoluble in benzol not more than 2 per cent.; sp. gr. 38° C./15·5° C. not less than 1·05 or more than 1·12; distillation, based on water-free oil, up to 210° C. not more than 5 per cent., and up to 235° C. not more than 25 per cent.; and coke residue not more than 6 per cent. Sampling and testing methods are prescribed for both materials.

Attila (S.). **Protection of wood against rotting.**—*Tekn. aikl.*, xxvii, p. 22, 1937. [Finnish. Abs. in *Chem. Abstr.*, xxxi, 8, pp. 2770, 1937.]

The use of Wolman salts is stated to have considerably reduced the cost and simplified the process of timber impregnation in Finland. They may be used in pressure tanks and also for painting, immersion, the Boucherie method, and drilling. Thanalith-U [*R.A.M.*, xv, pp. 333, 547] is the most toxic to wood-rotting fungi even at the low concentration of 0·5 per cent. and the most resistant to lixiviation.

Bryson (H. C.). **The preservation of wood against fungi and insects.**—*Paint Technol.*, i, 12, pp. 429–431, 1936; ii, 13, pp. 17–20; 14, pp. 51–53, 7 figs., 1937.

A popular account is given of the depredations of wood-destroying fungi and insects, together with a discussion of the problems of control. The writer has found that copper naphthenate [*R.A.M.*, xv, pp. 413, 622] (20 to 25 per cent. in naphtha, white spirit, or other solvent, 1 gall. per 200 sq. ft.) is an excellent fungicide with none of the drawbacks of coal-tar creosote. Where the brilliant green colour of this compound is objectionable, it may be replaced by the practically colourless zinc naphthenate, the toxic properties of which, however, are not so pronounced. Full directions for impregnation are given.

Brandenburg (E.). **Die sogenannte Glasigkeit der Steckrüben.** [The so-called glassiness of Swedes.]—*Z. PflKrankh.*, xlvii, 1, pp. 53–58, 1937.

The writer's observations in Germany indicate that 'glassiness' ('brown heart') of swedes [*R.A.M.*, xvi, p. 225 and next abstract], due to boron deficiency and controllable by treatment with 15 to 20 kg. borax per hect., is not restricted, like the analogous heart and dry

rot of beets, to dry soils with an alkaline reaction. It may therefore be expected to appear in districts where the corresponding beet disease is unknown.

COULSON (J. G.) & RAYMOND (L. C.). **Progress report on the investigation of brown heart of Swede Turnips at Macdonald College.**—*Sci. Agric.*, xvii, 5, pp. 299–301, 4 figs., 1937.

In greenhouse tests carried out in Quebec to study the relation of boron deficiency to brown heart of swedes [see preceding abstract] plants grown in pure sand cultures with a nutrient solution containing no boron remained normal for six to eight weeks, after which they developed yellowish, mottled, distorted leaves and died without forming a bulbous root. When 0·25 p.p.m. of boron were added, there developed purpling of the leaf-margins and under-surfaces, curling, ruffling, yellowing, and mottling of the leaf blades, galling and splitting of the petioles, midribs, and veins, rough skin, and reduced roots, together with very severe brown heart, and some cambial disintegration. With increased amounts of boron these symptoms became progressively less severe, no brown heart occurring with 2 p.p.m. or higher concentrations. Toxic effects began to show at 25 p.p.m., and increased progressively with added boron, but even with 100 p.p.m. plant development was quite good.

The amount of brown heart varied greatly from year to year in the same field, ranging in one selfed line during a five-year period from 38 to 80 per cent. Varietal susceptibility in a number of commercial varieties and a large group of selfed-line strains ranged from 11 to 73 per cent. brown heart; some varieties were markedly resistant but none was completely so. The average amount of brown heart for the period 1932 to 1934 on land given manure alone since 1912 was 72 per cent., on that given mineral fertilizer alone 99 per cent., and a combination of both was 89 per cent. In 1932 the mineral fertilizer alone gave 100 per cent. and the manure alone 60 per cent. brown heart. In greenhouse trials increasing soil acidity with hydrochloric acid from P_H 6·1 to 5·2 almost completely eliminated the disease, while raising the P_H value of the same soil to 7·2 with sodium hydroxide or lime markedly increased severity. Brown heart has been much reduced by maintaining a high soil moisture by irrigation.

In field tests in 1935 soil applications of 25 and 50 lb. borax per acre gave 14·22 and 5·78 per cent. brown heart, respectively, as against 46·67 per cent. in the untreated control. Applications of 20 lb. per acre or less in the same field in 1934 gave no control, the high amount of borax required probably being due to the calcareous nature of the soil (P_H 6·5 to 6·9).

WRIGHT (L. E.). **The rôle of elements other than nitrogen, phosphorus and potassium in crop production.**—*Sci. Agric.*, xvii, 5, pp. 283–293, 1937.

The author briefly discusses the place of calcium, magnesium, sulphur, iron, manganese, copper, zinc, and boron in plant nutrition [*R.A.M.*, xvi, p. 283] and outlines the results obtained during the past year from applications of 'trace elements' in experiments at Kentville,

Nova Scotia. In the experimental plots mangolds had been affected since 1926 by a physiological disorder resembling sugar beet crown rot, the symptoms consisting of a curling of the leaves, followed by browning or blackening of portions of the edges and stem, the leaves and stems sometimes finally falling away from the crown. An application of borax at the rate of 10 lb. per acre was given in the spring of 1935, and this completely controlled the disease on limed and unlimed plots (with soluble boron contents of 0·24 and 0·20 p.p.m., respectively), and increased the yield by 217 and 100 per cent., respectively, over that of the plot which did not receive boron but in all other respects received identical treatment.

The addition of magnesium and manganese was somewhat beneficial on unlimed plots, whereas zinc exerted a depressing effect on growth. Neither these elements nor copper increased the yield on the limed plots.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Regulations governing sanitary export certification.—3 pp., 1936.

Details are given of the revised rules and regulations, effective as from 21st September, 1936, and superseding those of 23rd July, 1931, governing the issue of sanitary certificates for the export of plants and products thereof from the United States. A fee of $1 is chargeable for each certificate granted.

Importation of Plants and Potatoes (Jersey) Order of 1936. Importation of British Potatoes (Jersey) Order of 1936. Guernsey Ordinance No. 9, 15th February, 1936.—6 pp., 1937. [Mimeographed.]

The regulations governing the importation of plants into Jersey (operative for a period of three years from 12th April, 1936) are concerned not only with the exclusion of new pests and diseases from the Island, but also with the prevention of their introduction, by way of Jersey, into England and Wales. With these ends in view, the importation of potatoes is prohibited from the United States, Canada, France [*R.A.M.*, xii, p. 799], Germany, Belgium, Denmark, and the Netherlands, and permitted from other countries only on production of a certificate vouching for the absence of wart disease (*Synchytrium endobioticum*) from a radius of 2 km. surrounding the place of cultivation, and further guaranteeing the variety to be officially recognized as immune. Regulations have further been made against the importation of elm trees and conifers [ibid., xiii, p. 63] and sugar beets and mangolds [ibid., xv, p. 335]. The importation of British Potatoes (Jersey) Order of 1936 requires that all potato consignments from England, Wales, Scotland, Northern Ireland, the Isle of Man, and the Irish Free State shall be accompanied by certificates vouching for the absence of *S. endobioticum* during the last three years from a radius of 500 yards from the place of cultivation.

Guernsey Ordinance No. 9 (15th February, 1936) brings the plant importation restrictions of the Island into line with the provisions of the English Importation of Plants Order of 1933 and the Destructive Insect and Pests Order of 1933 [ibid., xii, p. 800; xiv, pp. 272, 400].

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FREITAG (J. H.). **Negative evidence on multiplication of curly-top virus in the Beet leafhopper, Eutettix tenellus.**—*Hilgardia*, x, 9, pp. 305–342, 6 figs., 4 graphs, 1936. [Received April, 1937.]

The author points out that if the virus of sugar beet curly top [*R.A.M.*, xvi, p. 294] multiplies in the leafhopper vector *Eutettix tenellus*, the insects probably should not only retain the infective capacity during their entire adult life, but when fed for only a short period on a diseased beet should be able to cause as many infections as those fed for a longer time. In investigations made to ascertain whether the virus does in fact so multiply, the results obtained showed that there was no evidence to support the view that it does. Many infective leafhoppers lost their ability to produce infection during late adult life, and others, though retaining their infectivity, infected beets only at long intervals. Insects fed only for a short time on a curly-top beet averaged only 3·4 infections when transferred daily to successive healthy beets during adult life; insects fed for long periods averaged 15·6 infections. These results indicate that the leafhoppers are merely internal mechanical carriers.

Insects first infected during the latter part of their adult life did not transmit the disease as frequently as those infected early, but this loss of infectivity was less than that which occurs in infected insects maintained on healthy plants, and some leafhoppers re-infected during later adult life transmitted the virus as readily as recently moulted adults.

Great variation was noted in the length of the period of delay in the development of the infective capacity. The period that elapsed between the initial feeding of 10 minutes to 3 hours and the first infection varied from 1 to 44 days, and averaged 9·6 days. This result likewise affords no evidence of multiplication, as infections would be expected at regular intervals if there was an increase of virus in the insect.

YU (T. F.). **A bacterial stem blight of Broad Bean.**—*Bull. Chin. bot. Soc.*, ii, 1, pp. 32–42, 3 pl., 1936.

In the course of investigations on the broad bean (*Vicia faba*) stem blight (*Botrytis*) [*R.A.M.*, xvi, p. 230] in the Nanking district of China, a weakly pathogenic bacterium was isolated from blackened and decayed material. Inoculation experiments with the organism on wounded stems resulted in the development, after an incubation period

of 8 to 12 hours, of blackish lesions which rapidly extend under moist, warm conditions and may attain a length of 4 to 8 cm. in 24 hours. Ultimately the whole stem softens and rots. The inoculation of injured seeds induced infection in up to 82·1 per cent. of the resultant seedlings, the tips of which in severe cases became blackened and necrotic before the unfolding of the leaves, while the latter, especially the lower ones, were liable to develop an apical or marginal blackening.

The organism, an obligate wound parasite, is named *Phytomonas fabae* n.sp. It is a rod with rounded ends, 1·1 to 2·8 by 0·8 to 1·1 μ, motile by 1 to 4 polar flagella, occurring singly or in pairs, forming capsules but no spores, Gram-negative, non-acid-fast, aerobic; the circular, viscid colonies on nutrient agar are white when young, turning salmon-coloured with age, raised, smooth, zonate, or rugose; a white pellicle is formed on broth, a small amount of indol is produced and nitrate reduced; acid (without gas) is formed only from dextrose among the sugars tested; milk is neither coagulated nor peptonized, litmus and methylene blue in milk are reduced; the minimum, optimum, and maximum temperatures are 4°, 35°, and 37° to 38° C., respectively, and the thermal death point 52° to 53°.

Official Seed Testing Station.—*Rep. nat. Inst. agric. Bot., Camb., 1935–36*, pp. 14–16, [1937].

During the year ended 31st July, 1936, out of 40 samples of celery seed examined at the Official Seed Testing Station, Cambridge, only 3 were free from infection by *Septoria apii* [*R.A.M.*, xv, p. 552] and 6 contained over 60 per cent. of infected seed. Over half the samples were free from infection by *Phoma apiicola* [ibid., xv, p. 768], but 16 samples contained from 1 to 10 per cent. infected seed. *Helminthosporium avenae* [ibid., xvi, p. 20] developed on a number of oats samples and *Ascochyta pisi* [ibid., xvi, p. 298] on a relatively large number of pea samples.

Wood (F. C.). **Studies on 'damping off' of cultivated Mushrooms and its association with Fusarium species.**—*Phytopathology*, xxvii, 1, pp. 85–94, 2 figs., 1937.

Fusarium oxysporum, *F.* [*solani* var.] *martii* [*R.A.M.*, xiv, p. 615], *F. culmorum*, *F. flocciferum* [ibid., xv, p. 716], *F. redolens* [ibid., xiv, pp. 32, 409, 613], and *F. sambucinum* [ibid., xv, p. 765] and its form 6 were consistently detected in the casing soil of cultivated mushroom [*Psalliota* spp.] beds affected by various types of 'damping-off' in the south of England. The two first-named species were the most common, *F. oxysporum* attacking chiefly the brown variety of mushroom and *F. solani* var. *martii* the white. The symptoms induced by both are similar and include a pithy, withered texture, a brown discoloration of the interior of the stipe, a dark, burnished appearance of the pileus, reduction in size, asymmetrical development, and eventual mummification. Positive results were given by soil inoculation experiments with these two species of *Fusarium*, to both of which the brown type of mushroom proved considerably more resistant than the white.

Etorma (S. B.). **Chemical studies on Cassava products. I. The critical moisture-molding content of Cassava starch.**—*Philipp. J. Agric.*, vii, 4, pp. 409–412, 1 graph, 1936. [Issued 1937.]

The storage of cassava starch for long periods may become a problem with the development of the cassava-starch industry in the Philippines, the high prevailing humidity promoting the saccharification of the starch by moulds. In the experiments described samples inoculated with cultures of the *Aspergillus oryzae-flavus* mould group were placed on Petri dishes and subjected to 11 different treatments, in the open air, over water, over 1N, 2N, 3N, 4N, 5N, 10N, 15N, and saturated sodium hydroxide, and over saturated sodium chloride. Periodic determinations of moisture showed that the rate of moisture absorption or loss was very variable and that the critical moisture-moulding content was 19 per cent., much below which the cassava starch should be dried to keep it free from moulds.

Crosier (W. F.). **Prevalence and significance of fungous associates of Pea seeds.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1936*, pp. 101–107, 1936. [Received April, 1937.]

Careful examination of 6,500 samples of pea seed since 1932 indicated that only a few disease organisms are important, other fungi found being regarded as probable, but not common, associates of the seed. *Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes* occur annually in several samples of seed examined at Geneva, New York, especially in those from the eastern United States, eastern Canada, and England. Seed stocks produced in the Palouse district of Washington and Idaho are protected climatically from these fungi, and are commonly used throughout the United States. Affected seeds are not readily recognized when dry but generally show a slight to extensive, sunken or flush, firm or spongy, slightly discoloured to light brown lesion. A fine, dense, white mycelial growth develops after 4 to 7 days in germination tests, followed within 10 days by pycnidia.

Detection during germination of the pathogenic species of *Fusarium* associated with pea seeds is easy, owing to the copious, fluffy, white to pink or red fungal growths that develop, a pinkish coloration definitely identifying this genus. During 1935–6 many samples of peas produced in New York were found to contain appreciable percentages of *Fusarium*-affected seeds. Pathogenicity appeared to be weak. Experimental evidence showed that while *Fusarium* spp. and *Botrytis* sp. reduce the germination percentage of peas, they do not inhibit the growth of the emerged plants; *A. pisi* and *Sclerotium* sp. affect neither germination nor growth, and *Rhizoctonia* [*Corticium*] *solani* both reduces germination and markedly inhibits plant development, the emergence of seedlings from inoculated seed varying from 0 to 55 per cent., as against 85 per cent. in the controls. *C. solani* and *Sclerotinia sclerotiorum* were only occasionally found in commercial pea seed stocks.

A common saprophyte associated with pea seed stocks, regardless of their dead seed content, is the seed coat-inhabiting *Dematium* [*Pullularia*] *pullulans* [*R.A.M.*, xiv, p. 2], repeated pathogenicity tests with which on plants of many varieties gave negative results.

MILISAVLIEVIČ (D.). **Sur les causes de dépérissement de la Vigne en Frouchka Gora (Yougoslavie).** [On the causes of the dying-off of the Vine at Frouchka Gora (Jugo-Slavia).]—*Rev. Vitic., Paris*, lxxxvi, 2,220, pp. 25–26, 1937.

This is a reprint of the French summary appended to the author's recent communication on the serious dying-off of the vine at Frouchka Gora, Jugo-Slavia [*R.A.M.*, xvi, p. 229].

BRANAS (J.). **Chronique méridionale hebdomadaire. Le provignage et l'excoriose.** [Weekly note from the south. Layering and excoriosis.]—*Rev. Vitic., Paris*, lxxxvi, 2,222, pp. 77–79, 1937.

The author suggests that perhaps the chief reason why excoriosis [*Phoma flaccida*: *R.A.M.*, xvi, p. 151] of the vine has been and still is steadily gaining ground in southern France, is to be sought in the ever-increasing practice there of using grafted planting-material, since scions, in order to fit the stock, are mostly taken from the basal parts of the current year's main shoots, the buds on which almost invariably contain mycelium of the causal fungus [loc. cit.] in infected areas. He suggests further that the slight nature of the trouble in former years was probably due to the then prevalent practice, in renewing the vineyards, of layering from the old stocks, mostly by laying down and digging in the old stocks at the bottom of one-foot-deep trenches, only the apical parts, devoid of mycelium, of their shoots being used to form the new stocks. If these suggestions are correct, then in areas free from *Phylloxera* the old method might again be tried to keep down the disease, and where grafted stocks cannot be dispensed with, care should be taken to select the scions as much as feasible only from the upper two-thirds of the vine shoots.

SARAZIN (C.). **Traitements d'hiver de la Vigne.** [Dormant treatments of the Vine.]—*Agric. prat., Paris* (formerly *J. agric. prat., Paris*, N.S.), ci, 4, pp. 106–107, 1937.

Vine-prunings cut from the stocks following the harvest must on no account be incorporated with the soil but should be burnt or transferred to the silo to avoid the dissemination of fungal parasites. Painting the pruning wounds with tar or 30 per cent. iron sulphate with the addition of 1 kg. sulphuric acid per hectol. prevents the permeation of the medulla and wood vessels by *Stereum necator* [*R.A.M.*, xv, p. 631], besides ameliorating or curing such physiological disorders as chlorosis [ibid., xvi, p. 366], court-noué [ibid., xvi, p. 18], and non-parasitic apoplexy [ibid., xiv, p. 347].

ASBURY (C. E.), BRATLEY (C. O.), & PENTZER (W. T.). **Further observations on mold control in Grapes during transit and storage. 1935 season.**—*Blue Anchor*, xiii, 6, pp. 8, 9, 21, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvi, 3, p. 352, 1937.]

As in previous years, sulphur dioxide fumigation [against *Botrytis cinerea* and other moulds] exerted beneficial effects on grapes [*R.A.M.*, xv, p. 701, and next abstracts] shipped in crates [from California] to eastern markets for immediate consumption, and when combined with

the addition of sodium bisulphite to the packing-pads increased the duration of commercial life. The use of sodium bisulphite for this purpose, however, is still in the experimental stage, and careful supervision is required to determine the correct amount and proper distribution of the compound in the packing-materials.

Du Plessis (S. J.). **Control of Botrytis rot of Grapes.**—*Fmg S. Afr.*, xii, 130, pp. 36–37, 1937.

The best control of *Botrytis cinerea* [see preceding abstract] in Henab Turki grapes in the dusting experiments carried out at the Stellenbosch-Elsenburg College of Agriculture in 1935–6 was given by 80–20 verderame-sulphur mixtures. Satisfactory results were also given by the fumigation of the grapes with 4 per cent. formaldehyde gas, the Red Hanepoot variety benefiting particularly by this treatment. Another promising method of control consists in the application to the wood-wool box linings of a 6 per cent. formaldehyde solution (10 c.c. per box), or the spraying of corrugated paper linings with the same preparation at a concentration of 4 per cent., especially where the bunches are packed slanting. The rot was also well controlled by soaking ordinary grape-wrappers in a 1 per cent. iodine or 2 per cent. potassium iodide solution. Of the chemicals tested against *B. cinerea*, the most effective was ammonium bicarbonate (10 gm. per box), but further experiments are necessary before definite recommendations for this form of treatment can be made.

The fungus was found to develop extensively during cold storage at 34° F., and to grow rapidly thereafter at room temperatures.

In the vineyard the organism developed profusely after rain on dried cuttings and leaves on the ground, emphasizing the necessity for the destruction of all such material before the commencement of picking. The inclusion in packs of infected bunches not only leads to heavy infestation of the sheds but also involves severe wastage in storage by *B. cinerea* and to a lesser extent by *Penicillium*.

Dreyer (D. J.). **The effect of handling practices at Southampton and Nine Elms on the keeping quality of South African Grapes with a description of the discharge, handling and delivery of South African fruit from Southampton to Covent Garden.**—*Bull. Dep. Agric. S. Afr.* 161, 46 pp., 36 figs., 1 graph, 1936.

Boxes of South African White Muscat and Raisin Blanc grapes handled by ordinary methods prior to loading by rail were found to contain a higher percentage of 'wasty' and short-lived fruit due to infection by *Botrytis* [*cinerea*], *Penicillium* [see preceding abstracts], or other damage than those carefully handled and loaded to rail by means of the 'skid' (raised platforms or sledges) method. It was further shown that the extra handling necessitated by the off-loading of the boxes at Nine Elms (Southern Railway's London depot) and their transference to ordinary road vehicles leads to increased wastage and curtails the life of the fruit in comparison with that delivered direct in the original rail truck (road/rail container). Boxes receiving ordinary handling and delivered by road vehicle contain, 10 days after discharge,

1·5 per cent. more mouldy berries and 5·3 per cent. more total unsound fruit than those handled by the skid method and delivered direct by road/rail containers.

Some technical recommendations are made for improving the ordinary handling and delivery methods on the lines indicated without unduly retarding the work of dispatch from the Southampton docks.

Kort Verslag van het Rijksproefstation voor zaadcontrôle te Wageningen (tijdvak 1 Juni 1935—1 Juni 1936). [A brief report of the State Experiment Station for Seed Testing at Wageningen (period from 1st June, 1935, to 1st June, 1936).]—20 pp., 1936. [Received April, 1937.]

The following are among the items of phytopathological interest in this report of the Dutch Seed Testing Station. Only 4 per cent. of the total number of pea samples examined showed more than 10 per cent. infection by *Ascochyta pisi* [*R.A.M.*, xv, p. 74 *et passim*], from which Mansholt's hybrid extra-green short was practically free.

Phoma [*betae*] was frequently present in amounts exceeding 90 per cent. in the beet seed samples submitted for testing. The beneficial effects of seed disinfection were convincingly demonstrated in an experiment with sugar beets [ibid., xv, p. 190 *et passim*].

Alternaria radicina [ibid., xv, p. 768] was detected in numerous carrot samples; in two out of three lots of seed treated with ceresan dust, germination was increased by 37 to 49 and 59 to 71 per cent., respectively.

Over 31 per cent. of the black salsify [*Scorzonera hispanica*] samples examined showed mild infection by *Sclerotinia* [? *sclerotiorum*: ibid., xi, p. 767].

Ten out of eleven cabbage samples were more or less severely attacked by *P.* [*lingam*: ibid., x, p. 327], good control of which is stated to have been obtained by one hour's immersion in 0·25 per cent. ceresan solution.

Of the 525 wheat samples examined for the presence of bunt [*Tilletia caries* and *T. foetens*], 31 per cent. were entirely free from the disease, 34 per cent. showed less than 10 spores per drop [of test suspension], 31 per cent. more than 10 but less than 100 spores per drop, and in 4 per cent. the latter figure was exceeded.

Oats were in general nearly free from *Helminthosporium avenae* [ibid., xv, p. 73 *et passim*], but the Black President and Star varieties showed about 10 and 6 per cent. infection, respectively.

Division of Botany.—*Rep. N.Y. St. agric. Exp. Sta., 1935–36*, pp. 28–35, 1936. [Received March, 1937.]

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xv, p. 282], contains, *inter alia*, the following items of phytopathological interest. In field trials with sulphur fungicides against apple scab (*Venturia inaequalis*) summer oil materially increased adhesiveness, but, although not used after July 1st, gave a very objectionable residue. Catalytic sulphur almost eliminated foliage injury due to lime-sulphur, even when used in poor drying conditions or with calcium arsenate. Bordeaux mixture substitutes gave commercial control at low concentrations, but with too much injury. There is an urgent

need for a new fungicide for use against *V. inaequalis*, and it would appear that it must come from outside the sulphur and copper groups.

Experiments conducted since May, 1935, appeared to demonstrate the value of roguing in drastically reducing, though not entirely eliminating, 'mosaic' strawberry plants from affected stocks [loc. cit.]. In mixed experimental plantings of healthy and 'mosaic' plants no spread took place except by runner propagation.

Root rot of peas [? *Aphanomyces euteiches* and *Fusarium solani* var. *martii* f. 2: ibid., xiv, p. 151; xv, p. 339] is becoming increasingly serious, the causal organisms accumulating in the soil with each crop of peas. Rotation delays the onset of failure in point of time, but not as regards the number of crops. Failure occurs after about four crops.

Several mosaic-immune lines of Stringless Green Refugee beans [*Phaseolus vulgaris*: ibid., xvi, p. 11] were released for propagation.

Further tests showed that red [cuprous] copper oxide [ibid., xv, p. 282] give definitely promising results on lime-sensitive plants such as cucurbits, tomatoes, hops, and roses, any tendency to injury being largely corrected by amendment with cotton seed-oil emulsion.

Hop downy mildew [*Pseudoperonospora humuli*] was controlled by Bordeaux mixture, zinc oxide, and cuprous oxide, the last-named being selected by most growers because the least injurious, and in one garden increasing the yield by over 80 per cent.

In the section of this report dealing with seed investigations (p. 86) it is stated that *Rhizoctonia* [*Corticium*] *solani* is infrequently associated with pea seed [see above, p. 435]. Several isolations were extremely pathogenic, completely destroying the laboratory tests and reducing the soil germination of new crop seed stocks by 75 to 90 per cent.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1935–36*, pp. 97–113, 1936. [Received May, 1937].

Crosses of the non-commercial African watermelon varieties, Africa 8, 9, and 13, which are resistant to anthracnose (*Colletotrichum lagenarium*) [*R.A.M.*, xv, p. 698; xvi, p. 228] but susceptible to wilt [*Fusarium bulbigenum* var. *niveum*: ibid., xvi, p. 85], with [the wilt-resistant] Iowa Belle, Iowa King, and others were made by D. V. Layton. Resistance to anthracnose was dominant to susceptibility, and segregation in F_2 and F_1 from the back-cross demonstrated the presence of only a single factor pair for resistance and susceptibility. From these crosses strains resistant to both diseases were developed.

H. C. Murphy found 14 physiologic forms of oat crown rust [*Puccinia lolii*: ibid., xvi, p. 245 and below, p. 446] at 20 nurseries in different states. Forms 7 and 1 were most prevalent and two new ones were designated 40 and 41. The latter, together with forms 33 and 34, occurred only in the southern States. In 1935, the disease caused an estimated reduction of 20 per cent. in the total yield for Iowa. Selections from the crosses Victoria × Richland, Bond × Iogold, Bond × C.I. 2344, Markton × Rainbow, and Iowa 444 × Markton, showed outstanding resistance to *P. lolii*, stem rust [*P. graminis*], and smut [*Ustilago avenae* and *U. kolleri*]. The new variety Mutica Ukraina, C.I. 3259, was markedly resistant to crown rust, and in greenhouse tests was almost immune from forms 34, 35 (which attack Bond), and 41. The new South

African varieties S.E.S. 49, 42, and 52, and C.I. 3032, 3033, and 3034, were resistant to both rusts in the field, but susceptible to smut.

In 1936, W. J. Henderson and C. M. Nagel found that owing to cloudy, humid periods, during which sugar beet foliage bore a film of water continuously, penetration by the leaf spot fungus [*Cercospora beticola*: ibid., xv, p. 486] proceeded uninterruptedly even in the wider spacings, all the plants showing uniform infection.

In three seasons J. J. Wilson secured control of sweet potato-stem rot [*Fusarium bulbigenum* var. *batatas* and *F. oxysporum* f. 2: ibid., xiv, p. 150] by dipping the slips after pulling and before setting out in semesan solution (1 oz. per 3½ galls. water).

Studies by I. E. Melhus and W. J. Henderson showed that *Phoma terrestris* [ibid., xv, p. 486] attacks onion roots at any stage of development of the onion, but does not rot the tissues of the bulb. *Fusarium* [*vasinfectum* var.] *zonatum* f. 1 [ibid., xiv, p. 150] alone attacked onions only when these were artificially wounded, but in combined inoculations with *P. terrestris* it became a virulent secondary invader, causing a semi-dry rot.

Investigations by C. S. Reddy into the causes of flax failures indicated that the seed-rotting and seedling blight organisms are principally soil-borne Pythiaceous fungi. Seed treatment was effective, however, since flax becomes resistant soon after germination. In 1935, nine varieties of flax seed treated with new improved ceresan (½ oz. per bushel) gave 112 and 30 per cent. more plants on heavily and lightly infected land, respectively, than the untreated controls of the same varieties.

Of nine [tabulated] barley varieties tested by C. S. Reddy and H. D. Hughes the most resistant to scab [*Gibberella saubinetii*: ibid., xv, p. 487] were Peatland, Manchuria, and Spartan, with 10, 32, and 43 per cent. infection respectively, taking the amount present on the most susceptible variety (Glabron) as equivalent to 100 per cent. G. N. Davis and R. H. Porter found that *G. saubinetii* on barley seed can be as well controlled by the autotoxin as by ethyl mercury phosphate, at present the most effective dust treatment. The best results were given when 8 gm. of mass culture of the fungus were extracted with 100 c.c. of distilled water, and the seed soaked in the filtrate for 24 hours, later being kept at 10° C. until germinated.

Fifty-fourth Annual Report of the Ohio Agricultural Experiment Station 1934–1935.—*Bull. Ohio agric. Exp. Sta.* 561, 133 pp., 9 figs., 3 graphs, 1 map, 1936. [Received April, 1937.]

During the period under review very satisfactory control of scab [*Venturia inaequalis*] on Cortland, McIntosh, and Stayman apple trees was obtained in comparative spraying tests carried out by H. C. Young in Ohio with wettable sulphurs, used mostly at half-strength supplemented with lime-sulphur (half-strength) at pre-bloom and petal-fall, the best control ranging from 2·1 to 2·5 per cent. scab, as against 4·7 per cent. with lime-sulphur alone and 100 per cent. in the untreated controls.

In a study made by H. C. Young of apple tree measles [*R.A.M.*, xiv, p. 372] negative results followed attempts to transmit the disease by means of fungi, bacteria, sap, or bud grafts from diseased trees, and it

is concluded that it is probably due to some soil deficiency. This view is supported by the fact that many badly diseased trees recovered in the 1934–5 season, when good growing conditions prevailed. Further investigations are in progress.

In a comparative spraying test the best control of bitter rot [*Glomerella cingulata*: ibid., xv, p. 555; xvi, p. 368] on Rome Beauty and Ben Davis apples was given by Bordeaux mixture 2–3–50, followed in order by basic copper chloride, cuprous oxide, and basic copper sulphate, the apples treated with the last-named being little cleaner than the controls.

The formaldehyde content of dusts prepared with sawdust, kaolin and infusorial earth mixture, infusorial earth, formofume (a proprietary dust), marl, muck, gypsum, charcoal, and trioxymethylene with infusorial earth declined after six months' keeping from approximately 6 per cent. to 5·67, 5·56, 5·56, 5·5, 4·76, 4·5, 2·52, 1·02, and 5·85 per cent., respectively.

Of 80 bean [*Phaseolus vulgaris*] varieties in four different parts of northern Ohio the most resistant to bacterial blights [*Bacterium medicaginis* var. *phaseolicola*, *Bact. phaseoli*, and other spp.: ibid., xvi, p. 302] were Burpee White Wax, Dwarf Horticultural, French Horticultural, Henderson's New Stringless, Keeney's Stringless Refugee, Low's Champion, Refugee (1000–1) and Tennessee.

R. C. Thomas made some 200 isolations of the bacteriophage to *Aplanobacter stewarti* [ibid., xiv, p. 503]. In general these fell into two groups, a monovalent group effective against one or other of two strains of the organism [ibid., xii, p. 364], and a polyvalent group active against both strains. When a polyvalent phage was kept in association with one strain of *A. stewarti* the titre for that strain was increased and for the other correspondingly decreased.

EDSON (H. A.) & WOOD (JESSIE I.). **Diseases of plants in the United States in 1935.**—*Plant Dis. Reptr, Suppl.* 96, 289 pp., 12 graphs, 8 maps, 1936. [Mimeographed. Received May, 1937.]

This report, prepared on the usual lines [*R.A.M.*, xv, p. 427], contains valuable information on the incidence and distribution, in relation to meteorological and environmental factors, of the diseases affecting cereal, forage and cover, fruit, nut, vegetable, special, and sugar crops, trees, and ornamental and miscellaneous plants in the United States in 1935.

NAGY (R.), PETERSON (W. H.), & RIKER (A. J.). **Comparison of enzymes in crown-gall and non-inoculated plant tissue.**—Abs. in *Phytopathology*, xxvii, 2, p. 136, 1937.

Quantitative determinations of oxidase, peroxidase, and catalase yielded 130, 120, and 160 per cent. greater enzymatic activity, respectively, in the fresh crown gall [*Bacterium tumefaciens*] than in the contiguous non-inoculated tomato tissue [*R.A.M.*, xii, p. 148]. Fifty c.c. of expressed crown gall juice destroyed in ten hours half the tyrosin in 200 c.c. of a 0·05 per cent. solution, while no loss was detected from a similar preparation of non-inoculated tomato stem tissue.

Brown (Nellie A.) & Weiss (F.). **Crown gall of the fasciated type on Asparagus sprengeri.**—*Plant Dis. Reptr*, xxi, 2, pp. 31–32, 1937. [Mimeographed.]

Although the writers' attempts at the isolation of *Bacterium tumefaciens* from fasciated galls on two specimens of *Asparagus sprengeri* [*R.A.M.*, xvi, p. 321] from Oregon and Florida were unsuccessful, the neoplasms on the crown at or just above ground-level, were believed to be of the crown gall type, and this view was substantiated by the inoculation of germinating seeds and seedlings of *A. sprengeri* with the dahlia strain of *Bact. tumefaciens* [ibid., xvi, p. 302], which induced the production of a mass of fleshy, stem-like excrescences. Similar tests with the hop strain gave negative results. The crown gall organism was re-isolated from the outgrowths and inoculated into *Ricinus* [*communis*], Paris daisy [*Chrysanthemum frutescens*], and garden balsam [*Impatiens balsamina*], which developed characteristic stem galls. As a general rule asparagus, in common with other monocotyledons, is immune from crown gall, but *Bact. tumefaciens* is evidently capable, as shown by the present exceptional instance, of inducing fasciation in very young shoot tissues of this group of plants.

Preti (G.). **Iperplasia e tumori radicali della Margherita ('Chrysanthemum frutescens, Thunb.').** [Hyperplasia and root tumours of the Paris Daisy (*Chrysanthemum frutescens* Thunb.).]—*Ital. agric.*, lxxiv, 2, pp. 123–126, 4 figs., 1937.

Bacterium tumefaciens was isolated from tumours on the collar and roots of a crop of Paris daisy (*Chrysanthemum frutescens* Thunb.) [see preceding abstract] cultivated for industrial purposes at Bordighera, and inoculated into healthy plants with positive results. Control measures should include the avoidance of wounds, especially in the root system and collar, careful transplanting, and the application to the soil at the base of affected plants of a mixture of mineral superphosphates and iron sulphate. Severely diseased individuals should be eradicated and burnt, and a reasonable period allowed to elapse before replanting the crop on infested soil. Organic manures should not be applied.

Dillon Weston (W. A. R.), Hanley (F.), & Booer (J. R.). **Seed disinfection. II. Large-scale field trials of the disinfection of seed corn with mercury dust disinfectants.**—*J. agric. Sci.*, xxvii, 1, pp. 43–52, 1937.

A further account [*R.A.M.*, xv, p. 667] is given of field experiments in 1934–5 in four English counties, the tabulated results of which showed that treatment of the seed-grain of wheat, barley, and winter and spring oats with a proprietary mercury dust or with one of two experimental dusts (A and B) containing organic mercury compounds, had no harmful effect on the germination of the seed, when the dust was applied just before sowing, and in the case of spring oats when the seed was sown 7½ weeks after treatment. The dust A was prepared by mixing 100 lb. of filler (non-adsorbent aluminosilicate with an average particle diameter of 9 μ) with an aqueous solution of 0·55 lb. mercuric chloride (equivalent to 0·4 lb. Hg), and then adding to the dried mixture

1·375 lb. of methyl mercury iodide (equivalent to 0·8 lb. Hg); the dust B consists of 100 lb. of the same filler intimately mixed with an aqueous solution of 1·11 lb. of methyl mercury nitrate (equivalent to 0·8 lb. Hg). Both the proprietary and the two experimental dusts were effective in controlling wheat bunt [*Tilletia caries*]; in one series of tests, in which artificially bunted seed was used, the percentage of bunt in the ensuing crop was reduced from 11·8 in the control to 0·4 by the proprietary dust and to 0 by dust A. They were also effective against leaf stripe (*Helminthosporium gramineum*) and net blotch (*H. teres*) of barley, the percentage of which was reduced from 5·0 in the control to 1·0 by the proprietary dust and to 0·6 by dust B, the standard error being 0·2 per cent. The three dusts also increased the speed of 'brairding' [sprouting] of barley, but not the final population; the yield was not increased by the stimulation of seedling growth. In winter oats dust A alone gave a significant increase in plant population and reduced loose smut (*Ustilago avenae*) from 34·5 per cent. in the control to 0·03 per cent., the use of the proprietary dust resulting in 15·9 per cent. infection. In spring oats, on the other hand, the proprietary dust and experimental dust B significantly increased the plant population, and in the series of tests in which spring oat seed-grain, naturally contaminated with *H. avenae* was used, the percentage of infected seedlings was reduced from 22·0 in the control to 0·5 by the proprietary dust and to 0·2 by dust B.

The investigations indicate that discrimination should be used in selecting a disinfectant dust containing organic mercury compounds, since all seed-borne diseases cannot be controlled by the same preparation. Attention is also called to the poisonous and vesicant properties of the two experimental dusts, which require that efficient precautions should be taken when working with them.

PORTER (R. H.). **Relation of seed disinfectants to seed analysis.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1936*, pp. 93–101, 5 figs., 1936. [Received April, 1937.]

The commercial development of disinfectants for the control of cereal and other crop diseases not only affords seed analysts an opportunity to prescribe control measures, but also makes it possible in many instances to determine in the laboratory the probable value of seed disinfection. The condition of farmers' stocks of maize seed and the results of treating it [against *Diplodia zeae* and other fungi] have received comparatively little attention, and a study of such stocks have been made at the Iowa State College Seed Laboratory since 1929. In 1933 out of 40 samples of treated seed 92·7 per cent. gave strong germination, 4·7 per cent. weak germination, while 0·6 per cent. were diseased, the corresponding figures for 40 samples of untreated seed being 90·3, 6·7, and 3·5 per cent., respectively. In 1935 out of 471 samples of treated seed 89·6 per cent. showed strong germination, 3·4 per cent. weak germination, and 18 per cent. were diseased, the corresponding figures for an equal number of samples of untreated seed being 83·9, 5·8, and 65·7 per cent., respectively. The yield per acre of disinfected seed was 40·3 bush. against 39·9 bush. for the untreated in 1933 and 60·4 and 57·5 bush., respectively, for 40 samples tested in 1934.

The effect of ethyl mercury phosphate on the laboratory and field

germination of farmers' samples of barley seed infected with *Gibberella saubinetii*, *Fusarium* spp., and *Helminthosporium sativum* was determined, a close correlation being found between the laboratory and field germination of both the treated and untreated lots. Similar results were obtained with wheat. Thus of 5 samples each of treated and untreated wheat seed the former gave 83·8 and 2·5 per cent. strong and weak germination, respectively, with 0·1 per cent. seedling blight, the corresponding figures for the untreated seed being 71·5, 5·4, and 6 per cent., with 11·8 per cent. scab. Treated oats seed gave 86·7 and 5·1 per cent. strong and weak germination, respectively, as against 82·4 and 7·5 per cent. for untreated oats seed, with 5 per cent. scab; treated flax seed gave 65·7 and 5·7 per cent. strong and weak germination, while the figures for the untreated seed were 61 and 6 per cent. None of the copper, zinc, or formaldehyde dusts tested gave effective control of these fungi, but new improved ceresan ($\frac{1}{2}$ oz. per bush.) was a satisfactory disinfectant for wheat, oats, barley, flax, and sorghum. Merko, Garbak III, and new improved semesan jr. are recommended for the treatment of maize. The average field germination of five barley varieties was increased from 58·8 per cent. in the untreated controls to 76·4 per cent. in the case of seed treated with ethyl mercury phosphate diluted to 1 per cent. with talc. For laboratory use, a dilution of 1 part new improved ceresan in 4 parts of talc is recommended, the seed to be treated being placed in a cylindrical bottle with the dust and rotated on two horizontal rollers, one of which is turned by an electric motor.

The conditions which cause mercury poisoning [*R.A.M.*, xvi, p. 377] in plants are unknown, but samples that show it in the laboratory do not always display it in the field. Mercury-treated oats, barley, and wheat seed as well as untreated seed showed no decline in germinative ability after two years' storage, and no serious mercury poisoning in the case of the treated seed except when exhibited at the start.

Verhoeven (W. B. L.). **Zaaizaadontsmetting.** [Seed disinfection.]—*Tijdschr. PlZiekt.*, xlii, 10, pp. 255–274, 2 graphs, 1936.

A general account is given of the current methods of seed disinfection in Holland, with special reference to the combined hot water and chemical (e.g., germisan or ceresan) treatment of wheat seed-grain against loose smut [*Ustilago tritici*: *R.A.M.*, xvi, p. 241], in which connexion the relations between the water absorption by the seed at different temperatures during pre-soaking and immersion and the efficacy of the method are discussed [ibid., xv, p. 787]. The author states that seed-grain is generally placed too densely in the sacks, with the result that the grain in the middle of the sack does not absorb sufficient water. Before removing the grain from the pre-soak bath, the temperature of the water should be raised for a few minutes to 25° C. to prevent too great cooling of the grain during transference to the hot water steep. In practice the growers are inclined to regard seed disinfection as too onerous for regular routine, but the writer considers that all seeds known to carry diseases amenable to treatment should be regularly disinfected. A number of examples of such seed-borne diseases are cited. In conclusion, the growth of the co-operative movement in seed disinfection in Germany [ibid., xvi, p. 24] is reviewed.

VARADA RAJAN (B. S.). **The problem of rust of Wheat in India.**—*Poona agric. Coll. Mag.*, xxviii, 3, pp. 107–117, 1936.

A semi-popular account is given of the history, economic importance, and life-history of the yellow, brown, and black rusts of wheat (*Puccinia glumarum*, *P. triticina*, and *P. graminis*), with special reference to their occurrence in India and to the possibilities of their control by means of breeding [*R.A.M.*, xiv, p. 567].

PALMITER (D. H.) & KEITT (G. W.). **Studies of copper-lime arsenite dusts for control of Wheat bunt.**—Abs. in *Phytopathology*, xxvii, 2, p. 138, 1937.

Copper-lime arsenite dust mixtures were tested in five series of greenhouse trials in comparison with commercial copper carbonate and ethyl mercury phosphate dusts [*R.A.M.*, xiv, p. 381]. When wheat seed-grain infected by bunt [*Tilletia foetens*] was treated and planted in clean soil, all the dusts used gave practically complete control. When clean or diseased seed was planted in infested soil, certain copper-lime arsenite dusts consistently gave slightly better control than the commercial materials, and increased germination more than copper carbonate but less than the mercurial dust. Small-scale field experiments at Madison, Wisconsin, confirmed the greenhouse results and indicate that copper-lime arsenite preparations possess a relatively high fungicidal value under local conditions.

WELSH (J. N.). **The synthetic production of Oat varieties resistant to race 6 and certain other physiologic races of Oat stem rust.**—*Canad. J. Res.*, xv, 2, pp. 58–69, 5 figs., 1937.

In an attempt to combine in a single oat variety resistance to as many physiologic races of *Puccinia graminis avenae* [*R.A.M.*, xiv, p. 434, and next abstract] as possible, a cross was made between Hajira Strain (resistant to races 1, 2, 3, 5, and 7, semi-resistant to 9 and susceptible to 4, 6, 8, and 10) and Joanette Strain (resistant to 1, 3, 4, and 10, susceptible to 2, 6, 7, 8, and 9 and with an indeterminate reaction to race 5). Of 93 pure lines so obtained 71 were resistant at the seedling stage under greenhouse conditions at 60° F. to race 6, to which no commercial variety is resistant. At 65° to 70° about one-third of the 71 lines were resistant, one-third semi-resistant, and one-third susceptible to this race. At the fifth leaf, boot, and heading stages representative lines from each of these classes were resistant to race 6 at 60°. At 65° to 70°, the reactions differed at the different stages; at the fifth leaf stage only the tip of the top leaf was susceptible, at the boot stage pustules were present on the top node and internode, but the remaining parts were unaffected, while at heading the leaves and culms were resistant but one or two pustules were found on the topmost node or internode. Six lines consistently resistant to race 6 at 60° and 65° to 70°, were resistant in the seedling stage to all ten races except race 9 which was not studied at the same temperatures, while at 75° to 80° they were susceptible to race 6, indeterminate to races 1, 4, and 5, and resistant to the others. Under field conditions, six lines classed as resistant at 65° to 70°, five as semi-resistant, and four as susceptible, when tested

to race 6 all showed infections of a semi-resistant type on the uppermost internodes, the other parts being unaffected. Resistance in the hybrids to races 6 and 8 was probably obtained through transgressive segregation as neither parent is resistant to these races.

The standard varieties, Hajira Strain, Joanette Strain, White Russian, and Victory oats, used as controls, were susceptible to race 6 in all the greenhouse tests and also, except White Russian (which was semi-resistant), in the field test.

HUMPHREY (H. B.) & COFFMAN (F. A.). **A study of the reaction of F_1 Oat hybrids and their respective parental lines to inoculation with rusts and smuts.**—*Phytopathology*, xxvii, 2, pp. 183–189, 1937.

Experimental data are tabulated and discussed showing that none of the 28 F_1 progeny resulting from hybridization between widely different oat types gave any indication of susceptibility to smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) [*R.A.M.*, xv, p. 642; xvi, p. 309, and next abstracts], even in the nine out of 17 crosses in which one or other parent was susceptible. Likewise, none of the F_1 plants arising from the nine crosses made in 1935–6 was susceptible, although one or other of the parents became diseased in two of the nine. It is possible that the dehulling of the parent seed but not of the F_1 seed may have increased infection in the former, but the dominance of resistance over susceptibility to *U. avenae* and *U. kolleri* in the F_1 is believed to have been shown by these results.

The data obtained in a two-year study of the reaction of the offspring of 26 oat crosses to *Puccinia graminis avenae* race 2 [see preceding abstract] indicate that resistance is usually, but not invariably, dominant, while similar but less clear-cut results were secured in connexion with *P. coronata avenae* [*P. lolii*] race 1. It was observed in the rust studies that the F_1 plants of certain crosses tended to follow the type of resistance manifested by the more resistant of the parents.

REED (G. M.). **Report on the influence of the growth of the host on smut development.**—*Misc. Amer. Philos. Soc.*, i, 2, pp. 43–46, 1936.

Danish Island, Monarch, Scottish Chief, and Gothland oats were grown with and without sodium nitrate and with and without evening illumination from 8th February to 28th March and inoculated with three strains of covered and three of loose smut (*Ustilago levis* [*U. kolleri*] and *U. avenae*) [see preceding abstract]. The illuminated pots without nitrate made the most rapid growth, heading in about ten weeks, followed by the illuminated series with nitrate. The highly susceptible Monarch and Gothland varieties showed 100 per cent. infection in all the series, Danish Island 35, 44·4, 35, and 35 per cent. in the illuminated without nitrate, illuminated with nitrate, non-illuminated without nitrate, and non-illuminated with nitrate series, respectively, while the corresponding figures for Scottish Chief were 80, 65, 61·1, and 60, respectively.

In further experiments to determine the influence of soil moisture and temperature on the incidence of smut infection on oats in sand cultures, it was shown that almost invariably the heaviest amounts of disease are secured at about 20° C. with a low soil moisture content.

The course of development of the smuts, after entrance during the germination period of the host, does not appear to be substantially modified by differences in the rate or extent of the growth of the plants.

PICHLER (F.). **Über die Anfälligkeit verschiedener Hafersorten für Flugbrand.** [On the susceptibility of different Oat varieties to loose smut.]—*Neuheiten PflSch.*, xxx, 1, pp. 1–3, 1937.

Using a modification of Zade's method [*R.A.M.*, xii, p. 431], the writer inoculated twelve varieties of oats commonly cultivated in Austria with *Ustilago avenae* [see preceding abstracts], the resultant degrees of infection ranging from 0·3 per cent. in the highly resistant Tschermak's Yellow to 41·1 per cent. in the very susceptible Fichtelgebirg. Other resistant varieties included Waldsack's and Lochow's Yellow (0·7 and 2·4, respectively), while Duppau, Hirschbach, Schlägler, and Loosdorf Dreikorn must be reckoned as susceptible (23·5, 22, 20, and 19·1, respectively). The immersion of Hirschbach seed-grain for 30 minutes in 0·25 per cent. germisan reduced the incidence of infection from 27·7 per cent. in an untreated lot to 1·3 per cent.; the corresponding figures for 0·125 per cent. abavit (30 minutes), 0·2 per cent. ceretan [the Austrian name for ceresan] (30), 0·25 per cent. formalin (15), and 0·2 per cent. salvocer [ibid., xv, p. 569; xvi, p. 88] being 1·4, 1·7, 1·6, and 1·8 per cent., respectively. The freedom from infection ensured by seed treatment is thus in no case comparable to that arising from natural resistance to the pathogen.

KREBS (J.). **Untersuchungen über den Pilz des Mutterkorns Claviceps purpurea Tul.** [Studies on the ergot fungus *Claviceps purpurea*.]—*Ber. schweiz. bot. Ges.*, xlv, pp. 71–165, 2 diags., 14 graphs, 1936.

An exhaustive, fully tabulated account is given of the writer's comparative studies on *Claviceps purpurea*, *C. microcephala* [*R.A.M.*, xii, p. 294] and *C. paspali* [ibid., xvi, p. 36]. The material of the first-named species comprised three strains isolated by McFarland in the United States from *Bromus inermis*, *Festuca elatior*, and *Poa pratensis* [ibid., i, p. 109], two (HK and U) isolated from rye in Switzerland [ibid., iii, p. 85] and Hungary [ibid., iv, p. 181; xiv, p. 93], respectively, and two (Secale I and II) of unknown origin. One strain described by McFarland as *C. purpurea* from *Paspalum laeve* undoubtedly belongs to *C. paspali*, while another from *Glyceria borealis* may be identical with *C. wilsoni* Cooke, occurring in England on *G. fluitans* (*Gdnrs' Chron.*, iv, pp. 774, 807, 1875), or merely a physiologic form of *C. purpurea* distinct from that attacking rye. *C. microcephala* was isolated from *Phragmites communis*.

Two media were used for cultural investigations, namely, malt-agar or solution and Kirchhoff's cane sugar asparagin-agar [ibid., viii, p. 561]. The various strains exhibited striking differences in their physiological reactions in pure culture, especially as regards temperature. Thus the minimum for some strains of *C. purpurea* was —1° C., that of others and of *C. microcephala* 3°, while *C. paspali* made no growth below 6°. The optimum for *C. purpurea* ranged from 21° to 27° (12° to 24° for *C.* (?) *wilsoni*), while both *C. microcephala* and *C. paspali* developed

most abundantly at 24°. Marked differences in reaction to the hydrogen-ion concentration of the medium were further observed between *C. purpurea* from Swiss rye, *C. microcephala*, and *C.* (?) *wilsoni*, the optima for the two first-named ranging from P_H 5·21 and 5·68 and from 5·42 to 6·33, respectively, while the growth of the last was not appreciably influenced by the degree of acidity of the substratum. On the basis of temperature relations, food requirements, and colony type in pure culture two groups are clearly distinguishable within the physiologic species *C. purpurea* f. sp. *secalis*, viz., one isolated from rye sclerotia and the other originating on the wild grasses, *Poa pratensis*, *B. inermis*, and *F. elatior* [ibid., ii, p. 116].

In experiments on the germination of sclerotia of *C. purpurea*, Swiss and Czecho-Slovakian material exposed for one or three months to a temperature of −1° and then transferred to the greenhouse or garden, gave in one test 80 to 90 per cent. germination in garden soil, 30 per cent. in sand, and only 5 to 10 per cent. in quartz sand. A temperature range of 9° to 15° following one month's freezing, was most conducive to germination, which was inhibited at 18° and upwards; at and above 21° the sclerotia were severely damaged by moulds (especially at 27°), while at 33° *Cephalothecium* [*Trichothecium*] *roseum*, the agent of the so-called 'red ergot', developed in profusion. Perithecial formation, on the other hand, is favoured by a higher temperature.

In plots of winter rye there was a progressive augmentation in the ergot yield with each increase in the planting distance (10, 20, and 30 cm. as compared with the normal density of 1·3 kg. per are [100 sq. m.]) due to the irregular tillering of the crop which prolongs the flowering period and thus affords greater scope for secondary infection. In summer rye, on the other hand, the highest yields were obtained from densely sown plots, since the sparse planting resulted in large gaps and a heavy reduction of earing. The maximum ergot yields were secured from plots receiving liberal quantities of a complete fertilizer.

A positive correlation was shown to exist between the number of sclerotia in an ear and their total weight, so that mass infection, given a reliable means of inducing it should facilitate the procurement of ergot for medicinal purposes [ibid., ii, p. 400; xvi, p. 32]. A very close correlation was further demonstrated between the incidence of infection by *C. purpurea* and the relative ergot weight (expressed as a percentage of the total grain weight) of an ear, thereby affording statistical confirmation of the strict reciprocity between the development of the parasite and that of the host. There was a negative correlation between ear size and ergot infection, due to the fact that secondary infection by *C. purpurea* ('honeydew' conidia) the chief source of ergot, involves exclusively the late maturing tillering axes which always produce fewer flowers than the primary ones.

SCHULTZ (W.). **Maisbeulenbrand (Ustilago zeae).** [Maize boil smut (*Ustilago zeae*).]—*Forschungsdienst*, iii, 3, pp. 143–151, 1937.

The writer enumerates and briefly summarizes the contents of 64 papers dealing with maize smut (*Ustilago zeae*), the first record of which in Germany [*R.A.M.*, xvi, p. 245] is stated to date from 1833.

Ivanoff (S. S.). **Resistance to bacterial wilt of open-pollinated varieties of sweet, dent, and flint Corn.**—*J. agric. Res.*, liii, 12, pp. 917–926, 2 figs., 1936 (issued February, 1937).

An account is given of experiments in 1935 at the Wisconsin Agricultural Experiment Station, in which the resistance was tested by artificial inoculations [*R.A.M.*, xiii, p. 390] of 92 sweet, 17 dent, and 11 flint maize varieties [an alphabetical list of which is given] to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti* [ibid., xvi, p. 167 and next abstracts]. The results showed that the varieties in the three groups varied considerably in resistance, which was found to be highly correlated with the factors for height and lateness of the different varieties, independently of the group to which these varieties belonged. No difference was observed in the type and degree of resistance between the open-pollinated field maize, on the one hand, and that of open-pollinated sweet and flint maize, on the other. Of the varieties tested, those showing an index of resistance of 85 (compared with 100 for plants appearing normal), or above, included Golden Sugar (Ford), Honey June, Money Maker, Surecropper Sugar, Tucker Favourite (all sweet varieties); Funk 176 A, Iowa hybrids 931, 939, 942, Wisconsin hybrid $(A\times Hy)\times R_3$ (dent varieties); and Kutias (flint).

Ivanoff (S. S.) & Riker (A. J.). **Resistance to bacterial wilt of inbred strains and crosses of sweet Corn.**—*J. agric. Res.*, liii, 12, pp. 927–954, 3 figs., 1936 (issued February, 1937).

A fully tabulated account is given of experiments from 1933 to 1935, inclusive, which were carried out to test the resistance to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xv, p. 434 and preceding and next abstracts] of approximately 1,000 inbred strains of sweet maize and 1,000 F_1 hybrids and top crosses of the Golden Bantam type. Preliminary trials indicated that artificial inoculation had certain important advantages over natural infection as a method for testing resistance. The inbred strains were found to vary widely in their resistance, the taller strains, as a rule, being more resistant than the shorter, and the later maturing strains than the earlier. The hybrids and top crosses likewise showed considerable variations in resistance, the resistance being inherited from the inbred parents, and apparently was generally dominant in the hybrids. Tall and late hybrids, as a rule, were more resistant than the short and early hybrids, but hybrids produced from highly resistant inbreds usually showed high resistance independently of their degree of earliness or lateness. Highly resistant hybrids were mostly late but a few were early.

McNew (G. L.). **Isolation of pathogenic variants from pure cultures of Bacterium stewarti.**—Abs. in *Phytopathology*, xxvii, 2, p. 135, 1937.

Differences in pathogenicity of pure cultures of *Bacterium* [*Aplanobacter*] *stewarti* [see preceding abstracts] were determined by the average number of necrotic lesions per leaf produced by the inoculation of Golden Bantam sweet corn [maize] plants. Two of the variants derived from a pure culture by single-colony isolation, repeatedly induced 0·02

and 1·00 lesions per leaf, respectively, in inoculation tests extending over a year, and in turn gave rise to other variants by the same process. Variants of all degrees of pathogenicity were isolated from infected plants, most of those derived from a virulent strain resembling the original culture in this respect. The proportion of extreme variants from this virulent culture was reduced by host passage. Most of the variants isolated from a plant infected by a weakly pathogenic culture were more virulent than the original.

Sherbakoff (C. D.) & Mayer (L. S.). **Black ear rot of Corn.**—*Phytopathology*, xxvii, 2, p. 207, 1 fig., 1937.

Helminthosporium turcicum, well known as the agent of leaf blight of maize [*R.A.M.*, xv, pp. 201, 746], was isolated in 1931 at the Tennessee Agricultural Experiment Station from severely blackened and rotted ears in only 5 out of nearly 500 lines of the Neal's Paymaster variety. This is believed to be the first record of the fungus as the cause of ear rot of maize.

Storey (H. H.). **A new virus of Maize transmitted by Cicadulina spp.**—*Ann. appl. Biol.*, xxiv, 1, pp. 87–94, 1 pl., 1937.

This is a full report of the author's studies on the new mosaic-like disease of maize, termed by him 'mottle', a summary account of which was recently published [*R.A.M.*, xv, p. 529]. Owing to the transitory and slight nature of the symptoms, the existence of the disease in the field is only revealed by the fact that naturally occurring leafhoppers (*Cicadulina mbila*, *C. zeae*, and *C. storeyi*) may carry the virus, which so far has only been found in one locality near Tanga, Tanganyika Territory. Special tests showed that inactive races of the insect vectors usually fail to transmit the virus, although rare exceptions to this rule have been met. It was further shown that maize may be infected either simultaneously or consecutively with both the mottle and the streak viruses, the presence of one virus in a plant not preventing the development of the other, although under certain conditions the mottle virus may cause a significant delay in the development of the streak symptoms. The presence of either virus in one insect does not prevent it from taking up and transmitting the other.

Strickland (A. J.). **Mottle leaf of Citrus—preliminary note on correction in South Australia with zinc sprays.**—*J. Dep. Agric. S. Aust.*, xl, 7, pp. 579–585, 7 figs., 1937.

Satisfactory control of mottle leaf on 60 seven-year old late Valencia orange trees growing in South Australia was given by an application in March, 1936, of a mixture consisting of zinc sulphate 10 lb., hydrated lime 5 lb., or the same at half strength with 3 galls. skim milk per 100 galls. water followed by a second application of the full strength mixture or one of zinc oxide (3 lb. per 100 galls. water) early in October. Similar results were given by the same treatments in three other localities. The treatment resulted in a marked stimulation of the roots, which were originally heavily infested with nematodes (*Tylenchulus semipenetrans*).

REICHERT (I.) & PERLBERGER (J.). **The prevention of diseases in Citrus seedbeds.**—*Hadar*, ix, 11–12, pp. 253–259, 278–281, 17 figs., 1936. [Received May, 1937.]

Descriptions are given of the symptoms of damping-off, root diseases, stem blight (*Phytophthora parasitica* and *P. citrophthora*) [*R.A.M.*, xvi, p. 34] and 'albinism' (absence of chlorophyll in the leaves and stems) of citrus seedlings in Palestine. Preventive cultural measures include sowing in open seed-beds in the spring, using sandy clay covered with 1 cm. of pure sand and incorporating two-year-old manure; for winter sowing under glass-covered frames, the woodwork should be treated with carbolineum and a south-east or south-west aspect chosen. Seed should be taken from selected fruit, immersed for 30 minutes in ceresan (effective against albinism as well as pathogenic fungi) at a strength of 1 in 1,000 for sweet lime [*Citrus limetta*] and 1 in 2,000 for sour orange [*C. aurantium*], and sown in rows 4 to 5 cm. apart. Ceresan may also be used at a concentration of 1 in 500 for disinfection of the fruit destined for seed ($\frac{3}{4}$ to 1 hour), the treated fruit being preserved from decay as long as 6 months, and at 1 in 5,000 (8 l. per sq. m.) for soil treatment, two applications being given at a 48-hour interval; formalin 1 in 200 is also useful for this purpose. The seedlings should be given fortnightly applications of 0·5 per cent. Bordeaux mixture, increased up to 0·75 per cent. for outbreaks of disease, when the soil should also be treated with Bordeaux or 1 in 3,000 ceresan (3 to 4 l. per sq. m.).

SIMMONDS (J. H.). **Citrus diseases.**—*Qd agric. J.*, xlvii, 2, pp. 142–153, 2 pl., 1937.

Brief, popular notes are given on the symptoms and control of the following citrus diseases in Queensland: orange black spot (*Phoma citricarpa*) [*R.A.M.*, xvi, p. 247] and melanose (*Phomopsis* [*Diaporthe*] *citri*) [ibid., xvi, p. 395], scab of lemons and mandarin oranges (*Sporotrichum citri*) [*Sphaceloma fawcettii scabiosa*: ibid., xvi, p. 169], brown spot of Emperor mandarin oranges due to an unknown cause, moulding caused by *Penicillium digitatum* and *P. italicum* [ibid., xvi, p. 233], brown rot (*Phytophthora citrophthora* or *P. parasitica*) [see preceding abstract] and stem rot (*D. citri* or *Diplodia natalensis*) [ibid., xv, p. 797], pink disease (*Corticium salmonicolor*) [ibid., xiv, pp. 146, 627], psorosis of sweet orange, mandarin, and grapefruit [ibid., xvi, p. 367], exanthema [ibid., xiv, pp, 505, 628], mottle leaf [ibid., xvi, p. 93], collar rot and gumming of lemon, mandarin, and sweet orange [? *P. parasitica*: ibid., xiii, p. 356], root rot (*Armillaria mellea*), sooty mould (*Capnodium* spp. and other fungi), and smoky blotch due to a species of *Leptothyrium*.

BITANCOURT (A. A.) & JENKINS (ANNA E.). **Sweet Orange scab caused by Elsinoe australis.**—*J. agric. Res.*, liv, 1, pp. 1–18, 13 pl. (2 col.), 1 map, 1937.

This is a full and profusely illustrated account of the authors' investigation on the sweet orange scab caused by *Elsinoe australis* [*R.A.M.*, xvi, p. 94], which has been identified from Brazil (States of São Paulo, Rio Grande do Sul, Minas Geraes, Rio de Janeiro, and in the Districto Federal), from Argentina, Paraguay, and apparently also from Uruguay.

In São Paulo the sweet orange varieties known to be affected in the field are Bahia Navel, Pera, Sabará, Selecta, São Sebastião, Santos, Lima, and Mangaratiba, and the Abacaxi variety has been experimentally infected; the disease was also observed there on other kinds of citrus, e.g., the tangerine of Brazil (*Citrus nobilis* var.), tangerona (*C. nobilis*×*C. sinensis*), a sweet lime known as lima da Persia (*C. aurantifolia*), a sour lime known as limão seda (*C. aurantifolia*), laranja cravo (probably a variety of *C. nobilis*), and a pointed-leaf papeda (*C. hystrix*). In Argentina scab was found on the sweet orange varieties Ruby Blood, Sweet Mediterranean, Valencia, and Criolla. The chief economic importance of the trouble is that it severely blemishes the fruit, rendering unfit for export as much as one-third of the crop in numerous groves in São Paulo, while in some others from 50 to 60 per cent. is more or less badly scabbed. The leaves and twigs of the trees are rarely affected. The symptoms of the disease are described in detail.

The results of comparative studies showed that *E. australis* differs in cultural characters from *E. fawcetti* [loc. cit.], and that the strains of the former may be divided into two main groups, one of which gives a pulvinate, and the other a convolute type of growth in culture. The fungus also produced saltations in pure culture. While both *E. australis* and *E. fawcetti* grew at temperatures ranging from 9·5° to 39·5° C., the best growth of the former occurred between 24·5° to 29°, with an optimum probably near 26°, and the latter grew best at 20° to 24·5°, the optimum probably being near 21°. In pathogenicity tests, *E. australis* gave positive results on sweet orange, tangerine, and 'laranja cravo', and *E. fawcetti* on 'laranja cravo' and sour orange, but not on sweet orange; neither was capable of attacking the avocado pear.

X-ray machine shows inside characters of Citrus fruits.—*Calif. Citrogr.*, xxii, 4, p. 142, 2 figs., 1937.

A description is given of an X-ray machine, developed by the General Electric Corporation and installed in the laboratory of the California Fruit Growers' Exchange, which permits examination of the inside appearance of oranges and lemons on a fluoroscopic screen, and hence the detection and elimination of unsatisfactory fruits without cutting or waste. Good fruit with heavy juice appears dark on the screen, while a light appearance is given by immature, frozen or granulated fruit, and by fruit low in sugars. Any condition causing cell breakdown can be detected, internal decline of lemons being readily disclosed, but not *Alternaria* rot [*A. citri*]. It is estimated that at least $1\frac{1}{2}$ car loads of fruit can be passed through the machine in a day.

Lynch (L. J.). **The detection of wounding in Citrus fruits—preliminary note.**—*J. Coun. sci. industr. Res. Aust.*, x, 1, pp. 82–83, 1937.

Wounds in citrus fruits immersed in solutions of celliton yellow, acriflavine, or auramine were found to exhibit marked fluorescence when exposed to ultra-violet light. This method of detection is rapid, and permits the simultaneous examination of a tray of 50 fruits.

McDonald (J.). **Report on Coffee berry disease investigations in 1936.** —Reprinted from *Mon. Bull. Coffee Bd Kenya*, iii, 26, 4 pp., 1937.

In 1936, the amount of coffee berry disease [*Glomerella cingulata*: *R.A.M.*, xvi, p. 171] on the different varieties at the Sotik experiment station Kenya, estimated as percentages of diseased berries, was as follows: Blue Mountain imported seed (2 plots), 3·1 and 4 (or 8·2 including two abnormally infected bushes), local seed (2 plots) 4·4 and 5·3, Kent's Arabica (2 plots) 6·8 and 17·9, Plateau Bronze (2 plots) 6·8 and 9·2, Guatemala 8·1, Padang 11·7, Kenya Selected (2 plots) 13·6 and 33·7, and Bourbon 16·1. Neither applications of large amounts of organic nitrogen nor reduction in the nitrogen supply [ibid., xiii, p. 217] affected either the yield or the amount of infection that developed. Plots given dressings of sulphate of ammonia averaged 17·1 per cent. infection in 1936 as against 13·3 per cent. in the untreated control; application of zinc sulphate increased the incidence of the disease from 9·9 to 22·2 per cent. Plots given a mixture of 18 minor elements in addition to other substances also developed more infection than the untreated controls. In spraying experiments, plots treated with 1 per cent. Bordeaux mixture in January, May, and July averaged 4·4 per cent. infection, the corresponding figure for a plot similarly sprayed in March, May, and July being 11·5 per cent., and for the control 17·3 per cent.

Rudin (W.). **Topsterftebestrijding in de practijk.** [Top die-back control in practice.]—*Bergcultures*, xi, 9, pp. 289–291, 1937.

Failure to observe certain precautions and to discriminate between different stages of top die-back [*Rhizoctonia*] in Dutch East Indian coffee plantations [*R.A.M.*, xvi, p. 160] is stated to have brought H. R. A. Muller's method of control by the timely excision of diseased material into unmerited disrepute. Practical recommendations are made for the rational application of the system, and stress is laid on the necessity of burning all infected refuse: in a case known to the writer the neglect of this measure led to an increase in the incidence of die-back from 5 to 78 per cent. within a few months, whereas a drop from 7 to 3 per cent. was registered in another planting where the debris was destroyed.

De Fluiter (H. J.). **Corticium gardeniae Zimm. op Koffie.** [*Corticium gardeniae* Zimm. on Coffee.]—*Arch. Koffiecult. Ned.-Ind.* [x, 4], pp. 14–21, 7 figs., 1936. [Abs. in *Zbl. Bakt.*, Abt. 2, xcv, 21–26, p. 505, 1937.]

Corticium gardeniae, hitherto recorded only on *Gardenia florida*, was found in elevated plantations in Java producing silvery-white hyphae, 1 to 2 mm. in diameter, eventually developing into 'knots', on the stems and under-sides of the branches and petioles of coffee. The leaves are penetrated by the mycelium only after sclerotial formation, when they turn black and die, but are caught up and prevented from falling by the hyphae. Control consists in the excision of diseased material, spraying with Bordeaux mixture, and conservative pruning of the foliage of young plants.

MORSTATT (H.). **Kaffee-Schädlinge und -Krankheiten Afrikas (Schluss.).** [Coffee pests and diseases in Africa. (Conclusion.).]—*Tropenpflanzer*, xl, 2, pp. 47–65, 8 figs., 1937.

Continuing his survey of African coffee pests and diseases [*R.A.M.*, xvi, p. 247], the writer briefly summarizes the available information on the root rots due to *Armillaria mellea* [ibid., xv, p. 261], *Fomes lamaensis* [*F. noxius*: ibid., xiv, p. 31; xv, p. 16], *Macrophomina phaseoli* [ibid., xiii, p. 114], *F. lignosus* [ibid., xv, p. 16], *Ganoderma* sp., *Rosellinia necatrix* [ibid., xv, p. 283], *R. aquila* [ibid., viii, p. 378], *Ustulina zonata* [ibid., ii, p. 260], *Polyporus coffeae* [ibid., xiv, pp. 31, 357], and *Bacillus coffeicola* [ibid., xii, p. 91], and on the seed-bed infections caused by *Rhizoctonia* [*Corticium*] *solani* [ibid., xv, p. 632], *Fusarium* [? *lateritium* var. *longum*: ibid., xv, p. 780], and *Cercospora coffeicola* [ibid., xvi, pp. 247, 314].

WATKINS (G. M.). **Penetration and invasion of Phymatotrichum omnivorum in Cotton roots grown under pure-culture conditions.**—Abs. in *Phytopathology*, xxvii, 2, p. 143, 1937.

Sections through cotton seedling roots grown in nutrient agar and inoculated with a pure culture of *Phymatotrichum omnivorum* [*R.A.M.*, xvi, p. 176] showed that individual hyphae of the mycelial weft may penetrate the epidermal cell wall or root hairs. From the epidermis they grow through and between the cortical cells and finally invade the endodermis and enter the stele, where longitudinal progression has been observed in the various tissues of the vascular cylinder. The infected cells are ultimately killed, and in the later stages are almost entirely filled with hyphae. The penetration of the host cells may be accomplished by means of constricted hyphal tips, but definitely organized haustoria were not observed.

PELTIER (G. L.). **Distribution and prevalence of Ozonium root rot in the shelter-belt zone of Texas.**—*Phytopathology*, xxvii, 2, pp. 145–158, 2 pl., 1 fig., 1 map, 1937.

The areas within the shelter-belt zone of southern Oklahoma and Texas infested by root rot (*Ozonium* [*Phymatotrichum*] *omnivorum*) [see preceding abstract] were mapped out with a view to their avoidance for the cultivation of susceptible crops, such as cotton. Susceptible plants were used as indicators of infested territory and the universal distribution of three susceptible weeds (*Solanum eleagnifolium*, *Ambrosia* spp., and *Chenopodium album*) in virgin, pasture, waste, and cultivated lands was of material assistance in the detection of the fungus, useful indications as to the presence of which were further afforded by *Xanthium* spp., *Physalis* spp., *Helianthus* spp., and *Cirsium* spp. A section of land was deemed to be infested when the characteristic mycelial weft was observed on one or more diseased plants, or when conidial mats were found. On this basis the approximate limits of root rot infestation were fixed at south of 34° N. lat. and east of the 100th meridian, and the following are some of the resistant trees and shrubs recommended for planting in the affected sections: *Toxylon pomiferum* [*Maclura aurantiaca*], *Platanus occidentalis*, *Juniperus virginiana*, *J. scopulorum*,

Symphoricarpos orbiculatus, green ash (*Fraxinus pennsylvanica lanceolata*), *Hicoria* [*Carya*] *pecan*, *Thuja orientalis*, *Bumelia lanuginosa*, *Pistacia texana*, *Chilopsis linearis* [*C. saligna*], and *Tamarix gallica*. Among the more susceptible hosts of the fungus may be mentioned *Populus* sp., *Gleditsia triacanthos*, *Robinia pseud-acacia*, *Cornus asperifolia*, *Syringa* sp., *Ulmus americana*, *U. parvifolia*, *Morus alba tatarica*, *Catalpa speciosa*, *Juglans nigra*, *J. rupestris*, *Pinus nigra austriaca*, *P. ponderosa*, *Cupressus arizonica*, *Cercis canadensis*, and *Prunus angustifolia*. It was repeatedly observed that when root rot occurs near the headwaters of a stream it is usually distributed throughout the drainage basin, the incidence of the disease increasing at the lower levels. The sharp delimitation between infested and non-infested areas was very remarkable.

Progress Reports from Experiment Stations, season 1935–1936.—v+140 pp., 1 plan, 7 graphs, London, Empire Cotton Growing Corporation, 1937.

These reports [cf. *R.A.M.*, xv, p. 437] contain, *inter alia*, the following items of phytopathological interest.

In further experiments at Barberton, South Africa, on the transmission of internal boll disease (*Nematospora gossypii*) by *Dysdercus*, the results obtained suggest that transmission is purely mechanical and due to contamination of the mouth-parts of the insects, infection not persisting from one instar to the next owing to shedding of the exuvium during ecdysis. If spores passed from the midgut to the salivary glands the nymph might be expected to remain infected throughout life.

In a rotation experiment at Magut, Natal, a low yield from land cropped previously with sunflowers was attributed to the *Verticillium* wilt previously reported [loc. cit.]; the experiment comprised eight replications on the randomized block basis, with six different previous croppings, and the wilt was practically confined to the sunflower plots. Sunflowers are to be discontinued as a rotation crop.

In Southern Rhodesia the total adult stainer (*D. fasciatus*, *D. intermedius*, and *D. superstitiosus*) population was under 500 per acre during the first four weeks that most of the bolls were developing and then rose to about 2,500 per acre by mid-May, remaining at this level until about mid-June; thereafter (consisting almost entirely of *D. fasciatus*) it became markedly more numerous and decreased at the end of July and in August. Only about 5 per cent. of the bolls were moderately or heavily stained in April and the first two weeks of May, the figure rising to 20 per cent. in mid-June, when most of the crop was matured. The loculi of matured bolls (not damaged visibly by bollworm punctures) in which the seed cotton was unstained or lightly stained amounted to between 80 and 90 per cent. of the crop.

In breeding work at Serere, Uganda, S.P. 102, derived probably from a hybrid between S.G. 29 and an unknown cotton was outstanding as regards lint length and blackarm [*Bacterium malvacearum*] resistance. In the F_1 generation from the Serere hybrids the S.G. 29 elements increased susceptibility to blackarm. Also, the F_1 plants from two resistant parents showed more susceptibility than either parent, this observation showing the necessity for sustained re-selection against

blackarm, as deterioration is likely to set in as soon as open crossing is permitted in the field. In a miniature trial all the 13 varieties tested were much more resistant to blackarm than S.G. 29 [ibid., xvi, p. 235] and gave from 19 to 84 per cent. higher yields.

At Morogoro, Tanganyika, large quantities of cassava seed were inter-sown between rows of setts affected with mosaic [ibid., xvi, pp. 87, 301]; exceptionally good germination resulted, and many seedlings have remained healthy. Over 100 seedlings exposed for eighteen months without becoming affected have been replanted in progeny plots with surrounding infected rows.

In a test made in Nigeria the cotton strains D–31, E–31 (derived from Standard and immune from leaf curl), and S.G. 27 (introduced from Uganda in 1931) showed, respectively, 0·4, 0, and 4·2 per cent. leaf curl, as against 3·2 per cent. in the case of Standard ordinary commercial seed; in the previous season Standard and D–31 had shown 14·2 and 1·8 per cent. leaf curl, respectively. The increased lint yields per acre of D–31 over Standard were 39, 40, and 41 per cent. in 1933, 1934, and 1935, respectively, but the former strain produces inferior yarn to Standard, E–31 gave markedly better yarn than D–31, while S.G. 27 gave equal yields of lint to Standard in 1932 and 1935, and of better quality, though with this strain there is a danger of reduced yield owing to leaf curl.

Masera (E.). **La 'Beauveria globulifera (Speg.) Picard' parassita del 'Bombyx mori L'.** [*Beauveria globulifera* (Speg.) Picard a parasite of *Bombyx mori* L.]—*Annu. Staz. bacol. sper. Padova*, xlviii, pp. 381–397, 1936. [Abs. in *Ber. wiss. Biol.*, xli, 9–10, p. 671, 1937.]

The writer's cultural experiments and microscopical and biological studies at Padua showed that *Beauveria globulifera* [*R.A.M.*, xiii, p. 302] occurs in a parasitic form on silkworms, the strain isolated from which is designated var. *bombycis*.

Bory (L.). **Mycose cutanée et sous-cutanée. Aspergillose possible.** [Cutaneous and subcutaneous mycosis, possibly aspergillosis.]—*Bull. Soc. franç. Derm. Syph.*, *1937*, 2, pp. 277–283, 4 figs., 1937.

From recurrent abscesses in the cervico-maxillary region of a 56-year-old woman the writer isolated on Sabouraud's agar and other media an *Aspergillus* resembling *A. fumigatus* [*R.A.M.*, xvi, p. 317] in its mode of development, but the species under observation prefers a relatively low temperature (25° C.) instead of 37° at which the *A. fumigatus* thrives; no attempt is made at closer identification of the fungus at the present stage. The case is of interest on account of the comparative rarity of cutaneous aspergilloses.

Marquardt (F.). **Die Kultur des Mikrosporon furfur.** [The culture of *Microsporon furfur*.]—*Derm. Wschr.*, civ, 6, pp. 117–180, 4 figs., 1937.

Pure cultures of a fungus presenting the typical features of *Microsporon* [*Malassezia*] *furfur* [*R.A.M.*, xv, p. 295] were obtained from 5

out of 11 cases of pityriasis versicolor on Grütz's medium with the following composition: 9 gm. agar, 2·5 gm. each of peptone and sodium chloride, 2·5 c.c. glycerine, and 30 gm. Nervina malt per 500 c.c. distilled water. At the tenth day the colonies were brown and radially sulcate, with a button-like central protuberance, and consisted at this stage of a dense weft of long, septate hyphae and an abundance of spores. One to two weeks later the surface of the culture was dark brown, crumbly, and composed entirely of spores, which were readily subculturable and produced new colonies, the hyphae proceeding from a protrusion in a manner strongly reminiscent of the emergence of a shoot from a bulb.

BURKWALL (H. F.). **Tinea imbricata in Hainan.**—*Chin. med. J.*, li, 1, p. 91, 1937.

Notes are given on two cases of tinea imbricata or tokelau examined by the writer in Hainan, China, and attributed by him to *Endodermophyton* [*Trichophyton*] *concentricum* (*E.* [*T.*] *indicum* and *E.* [*T.*] *tropicale*) [*R.A.M.*, xiv, p. 308; xvi, p. 40].

MILOCHEVITCH (S.). **Une nouvelle espèce de Trichophyton mégasporé à culture glabre, T. immergens n.sp.** [A new species of megasporous *Trichophyton* of smooth aspect in culture, *T. immergens* n.sp.]—*C. R. Soc. Biol., Paris*, cxxiv, 5, pp. 469–471, 1937.

From a female patient at Belgrade suffering from circinate herpes of the right leg the writer isolated a *Trichophyton* forming on glucose agar raised, greyish colonies, covered with a sparse, white down (invisible to the naked eye), with a broad central zone of large, uneven, immersed rays. On maltose agar the pale yellow centre of the colony is surrounded by a ring of thick, white down, with a narrow band of short, even, densely aggregated rays at the periphery. On natural media, such as wheat ears [*R.A.M.*, xvi, p. 383 and next abstracts] the fungus develops simple spore clusters (*Acladium* type), compound clusters, long, characteristic tendrils, and numerous thick, crozier-shaped hyphae. The fungus is considered to be a new species and is named *T. immergens*.

CATANEI (A.). **Sur l'appareil conidien des Trichophyton violaceum et glabrum.** [On the conidial apparatus of *Trichophyton violaceum* and *glabrum*.]—*C.R. Soc. Biol., Paris*, cxxiv, 4, pp. 341–342, 1937.

Twenty-three strains of *Trichophyton violaceum* [*R.A.M.*, xvi, p. 383 and next abstracts] from Algeria and Greece were cultured on a medium composed of 60 gm. rice flour and 20 gm. agar in 1 l. water, under which conditions they produced smooth, velvety, pale mauve colonies, covered in a few instances with a short down. At the end of a month five of the recently isolated strains had formed numerous conidia of the *Acladium* type. One of the Algerian *T. violaceum* strains formed abundant conidia in culture, but subcultures on glucose agar produced only smooth colonies devoid of spores [cf. preceding abstracts]. Two out of four strains of *T. glabrum* [ibid., xv, p. 151; xvi, pp. 40, 101] also produced reproductive organs on the rice flour medium. *T. violaceum* and

T. glabrum may now be definitely ranged in the endothrix section of *Trichophyton* [ibid., xvi, p. 40].

CATANEI (A.). **Sur la résistance des champignons des teignes dans le milieu extérieur.** [On the resistance of ringworm fungi in the external medium.]—*C.R. Soc. Biol., Paris*, cxxiii, 35, pp. 1043–1044, 1936.

The question of the duration of viability of the ringworm group of fungi after severance from the host is of great importance from the epidemiological standpoint. *Ctenomyces mentagrophytes* (*Trichophyton radiolatum*) [*T. mentagrophytes*: *R.A.M.*, xvi, p. 317] was found to remain viable on a fragment of reed in the laboratory from June, 1928 to October, 1931, and on a piece of wood from June, 1930 to November, 1932. Viable cultures of *T. violaceum* and *T. glabrum* [see preceding abstracts] were further secured from infected hair after a year and nine months in eight instances out of 15, while *T. plicatile* [ibid., xvi, p. 383] grew after six months' preservation. Three out of seven cultures from cases of microsporosis [*Microsporon* spp.] were viable after six months, one year, and 1½ years, respectively, while only one out of ten from favus [*Achorion* spp.] squamae developed after 11 months.

OLÁH (D.). **Einfluss der Temperatur und der Nährbodenfeuchtigkeit auf die makroscopische Form der Pilzkolonien.** [The influence of temperature and humidity of the nutrient medium on the macroscopic form of fungus colonies.]—*Derm. Wschr.*, civ, 6, pp. 185–189, 10 figs., 1937.

During the winter months in Hungary laboratory temperatures (at which the dermatophytes are commonly cultured) are liable to undergo extensive fluctuations, sometimes sinking to 10° or even 8° C. during the night. Under these conditions the macroscopic features of certain representatives of the groups under observation presented striking variations. A strain of *Microsporon audouini* [*R.A.M.*, xvi, p. 316], for instance, entirely ceased growth during three winter months after forming six radial grooves typical of *M. tardum* [ibid., xiii, p. 577], but resumed development in the spring. In other cultures of *M. audouini* the characteristic radial furrows were replaced by the concentric circles associated with *M. iris*. This phenomenon suggests that *M. tardum* and *M. iris* may be merely variants of *M. audouini*. The typical 'tobacco pouch' cultures of *Trichophyton regulare* assumed various anomalous forms resembling, e.g., *T. exsiccatum* Ballagi, *T. cerebriforme*, and *T. crateriforme* under the influence of desiccation of the medium, while *T. violaceum* [see preceding and next abstracts] and Kaufmann-Wolf's *Epidermophyton* [ibid., xv, pp. 219, 802] are also liable to modifications of various kinds in response to changes in the two environmental factors under discussion.

LANGERON (M.). **Observations statistiques et mycologiques sur les teignes humaines au Maroc.** [Statistical and mycological observations on human ringworms in Morocco.]—*C.R. Acad. Sci., Paris*, cciv, 5, pp. 372–374, 1937.

The examination of 464 cases of ringworm in Spanish Morocco

[*R.A.M.*, xvi, p. 39] yielded 160 of trichophytosis, 157 of which were due to *Trichophyton violaceum* and *T. glabrum* [see preceding and next abstracts], and 304 of favus, 175 caused by *Achorion schoenleini* and the remaining 129 falling into five cultural types: (1) *A. milochevitchi* (colonies surrounded by a broad immersed zone), found in 77 cases compared with 55 out of 270 in the French zone; (2) *A. brumpti*, with granular, yellowish, profusely developed colonies, isolated from 36 of the French and 6 of the Spanish cases; (3) *A debueni*, characterized by small, farinaceous colonies (31 French, 22 Spanish); (4) *A. pittalugai*, with markedly crateriform colonies (6 French, 15 Spanish); and (5) *A. talicei*, having colonies shaped like wheels, with rims and thick spokes. The complete absence of *A. schoenleini* from the French Moroccan material is noteworthy. *T. violaceum* and *T. glabrum* were also responsible for the relatively few cases of trichophytosis in French Morocco.

TAKATSUKI (S.). **Über die Dermatomykose und ihre Erreger in Sachalin.** [On dermatomycosis and its agents in Saghalien.]—*Jap. J. Derm. Urol.*, xl, 4, pp. 150–153, 1 col., fig., 1936.

Of the 78 cases of juvenile dermatomycosis examined by the author in Saghalien in 1933, 56 were due to *Microsporon japonicum* [*R.A.M.*, xv, p. 580], 11 to *Trichophyton interdigitale*, 5 to *T. violaceum* [see preceding abstracts], 2 to *T. rubrum* [see next abstract], and one each to *T. glabrum*, *T. pedis* [ibid., xiii, p. 164], *Epidermophyton inguinale* [*E. floccosum*: ibid., xvi, p. 316], and *M. karafutoense* n.sp. The last-named forms on Sabouraud's glucose agar at 27° C. orange-yellow colonies, at first with a faint greenish tint covered with white down, later turning a more vivid orange in the centre, deep to pale yellow towards the periphery; five to six shallow grooves radiate from the central protuberances. Numerous pluriseptate spindles were observed, also (in hanging drops) racquet-shaped mycelia, a few aleuria, nodular organs, chlamydospores, and pectinate elements. The spores (2 to 3 μ in diameter) occur in masses at the roots of the infected hairs, the interior of which also shows a fungal network; the septate mycelium, 3 to 4 μ in diameter, is found in the epidermal scales. Inoculation experiments on guinea-pigs and cats gave positive results and the fungus was also transmitted to human patients.

GOUGEROT (H.), BLUM (P.), & DUCHÉ [J.]. **Trichophytie circinée due au 'Trichophyton rubrum'.** [Circinate tricophytosis due to *Trichophyton rubrum*.]—*Bull. Soc. franç. Derm. Syph., 1937*, 2, pp. 267–269, 1937.

Clinical details are given of a case of ringworm of the neck in a 25-year-old Frenchwoman, who had never been abroad, due to *Trichophyton rubrum* [*R.A.M.*, xv, p. 439], an exotic fungus rarely recorded in Europe and the origin of which could not be traced.

GOUGEROT (H.) & DUCHÉ (J.). **Mycose sous-cutanée nouvelle due à 'Debaryomyces klöckerii'.** [A new subcutaneous mycosis due to *Debaryomyces kloeckerii*.]—*Bull. Soc. franç. Derm. Syph., 1937*, 2, pp. 266–267, 1937.

From chronic labial ulcers in an elderly male patient the writers

isolated on Sabouraud's glucose agar at 25° C. a fungus with a creamy-whitish mycelium composed of pseudo-hyphae with irregular cells, generally elongated and measuring 2 to 4 μ in diameter; echinulate ascospores (one in each irregularly shaped ascus), 2 to 2·5 μ in diameter, developed on Gorodkowa's agar. The organism is identified as *Debaryomyces kloeckerii*, apparently not hitherto known as an agent of cutaneous lesions.

NEGRONI (P.). **Mykologisches Studium des ersten argentinischen Falles von Chromomycosis Fonsecaea (n.g.) pedrosoi (Brumpt, 1921).** [A mycological study of the first Argentinian case of chromomycosis *Fonsecaea* (n.g.) *pedrosoi* (Brumpt, 1921).]—*Rev. Inst. bact., B. Aires*, vii, pp. 419–426, 1936. [Spanish. Abs. in *Zbl. Haut- u. GeschlKr.*, lvi, 2, p. 134, 1937.]

A fungus isolated in pure culture from the first case of chromomycosis observed in the Argentine agreed with Fonseca and Leão's description of *Acrotheca* [*Trichosporium*] *pedrosoi* [*R.A.M.*, xvi, p. 384] except for the occurrence of a dual type of fructification normally absent from *Acrotheca* and such related genera as *Hormodendrum* and *Trichosporium*. The name of *Fonsecaea pedrosoi* n.g., n. sp. is therefore proposed for the organism.

TAKAHASHI (Y.). **Zur Chromoblastomykose. (II. Mitteilung.) Über Chromoblastomykose, hervorgerufen durch Hormodendrum japonicum n.sp.** [Second note on chromoblastomycosis. On chromoblastomycosis caused by *Hormodendrum japonicum* n.sp.]—*Jap. J. Derm. Urol.*, xli, 2, pp. 53–64, 7 figs., 1937.

Hormodendrum japonicum n.sp., isolated from an abscess on the right hand of a 77-year-old peasant, is characterized by olive-green hyphae, 2·5 to 5 μ in diameter, and by two kinds of fructification, blastospores and arthrospores. The blastospores are borne in branching chains on undifferentiated conidiophores and are mostly ovate, rarely ellipsoid or lemon-shaped, smooth, uni-, seldom bicellular, 3 to 8 by 2 to 5 μ, and denticulate at both ends. The concatenate arthrospores are globular, ovate or ellipsoid, olive-green, smooth, uni-, seldom bicellular, 4 to 10 by 3 to 4 μ, non-denticulate and more persistent than the blastospores. Terminal and intercalary, globular or oval, olive-green chlamydospores, 4 to 14 μ in diameter, occur in old cultures.

The fungus made good growth at 37° C. on Sabouraud's glucose and maltose agars, beer wort agar, Pollacci's medium, and other substrata, forming downy, brownish-green to greenish-grey, gradually darkening colonies, with a button-shaped or conical central protuberance and radial grooves terminating in dendriform elements. None of the sugars tested underwent fermentation. Positive results were obtained in inoculation tests on the patient and on laboratory animals; in the tissues of the latter the fungus formed brown to brownish-black spores, 4 to 10 μ in diameter.

CIFERRI (R.) & REDAELLI (P.). **Morfologia, biologia e posizione sistematica di Coccidioides immitis Stiles e delle sue varietà, con notizie sul granuloma coccidioide.** [The morphology, biology, and

systematic position of *Coccidioides immitis* Stiles and its varieties, with notes on coccidioidal granuloma.]—*Mem. R. Accad. Ital.*, vii, 13, pp. 399–475, 8 pl., 13 figs., 1936. [Received April, 1937.]

In this detailed account of a study of 15 strains of *Coccidioides immitis* [*R.A.M.*, xv, p. 503; xvi, p. 318] the authors, after pointing out that the only valid name for the monotypic genus is *Coccidioides*, state that the cultural characters were to a large extent constant for all the strains except Weidman's No. 2322, which they regard as a distinct variety and name *C. immitis* var. *pipkini* Cif. & Red.

The strains formed white, smooth, and simple colonies on media containing carbohydrates, and granulose-plicate on others, organic nitrogen being necessary for growth. They did not ferment carbohydrates, slowly alkalized the medium and liquefied gelatine, produced indol, and had no effect on milk. On ordinary media the morphological characters were extremely simple; regularly branched hyphae were present with a few, generally intercalary chlamydospores. More complex characters developed under special cultural conditions, Moore's strain from North America giving rise to small sporangia with zoospores. Zoospore conjugation in groups of two, occasionally three, was observed for the first time for this organism, but the further development of the gametes could not be followed. The formation of zoosporangia and endospores took place (except under special conditions) only in living animal tissues. Some strains were fatal to susceptible laboratory animals, while others were weakly pathogenic and formed few zoosporangia [ibid., xiv, p. 445]. The evidence demonstrated that the reputed ascus [ibid., xii, p. 170] is a sporangium, not an ascus.

The paper concludes with a full description of the family and species; a complete synonymy of *C. immitis*, including *Blastomycoides dermatitidis* Cast. (non *Blastomyces dermatitidis* Gilchrist & Stokes) [loc. cit.], *Geotrichum louisianoideum* [loc. cit.], *G. immite*, *G. dermatitidis* Cast. (non *Blastomyces dermatitidis* Gilchrist & Stokes), and *Scopulariopsis americana* [ibid., xiv, p. 100], and an account of the clinical and anatomical features of the disease. There is a bibliography of 90 titles.

Ciferri (R.) & Redaelli (P.). **Paracoccidioidaceae, n. fam., istituita per l'agente del 'granuloma paracoccidioide' (Paracoccidioides brasiliensis).** [Paracoccidioidaceae, n. fam., established for the agent of 'paracoccidioidal granuloma' (*Paracoccidioides brasiliensis*).]—*Boll. Ist. sieroter. Milano*, xv, 2, pp. 97–102, 1936. [German summary. Received April, 1937.]

A concise survey is given of the writers' studies on the cultural, morphological, and biological properties of four strains of *Paracoccidioides brasiliensis* [*R.A.M.*, xvi, p. 318], the agent of Brazilian paracoccidioidal granuloma, also known as Lutz's, Splendore's, or d'Almeida's disease. Special attention is paid to the mode of reproduction of the fungus in human tissue, and in this connexion the phenomenon of cryptosporulation is elucidated. Following a discussion on the relationships of *P. brasiliensis* with other protists, especially *Coccidioides immitis* [see preceding abstract] and *Amoebochytrium*, a new family, Paracoccidioidaceae, is established to accommodate the first-named organism in the ranks of the Chytridiales.

CIFERRI (R.), REDAELLI (P.), & SCATIZZI (IDA). **Unità etiologica della malattia di Seeber (granuloma da Rhinosporidium seeberi) accertata con lo studio di materiali originali.** [The etiological unity of Seeber's disease (granuloma due to *Rhinosporidium seeberi*) confirmed by the study of original specimens.]—Reprinted from *Boll. Soc. med.-chir. Pavia*, xiv, 5, 24 pp., 1 pl., 1936. [Received April, 1937.]

Comparative histopathological and mycological studies on specimens of human and equine rhinosporidial granulomata established the etiological unity of the disease from both sources and its causation by *Rhinosporidium seeberi* (Wernicke 1903) Seeber 1912 emend. Ashworth 1923 [*R.A.M.*, xv, p. 803], as synonyms of which are listed *Coccidioides* sp. Seeber, *Coccidium seeberia* (Wernicke) Belou 1903, *R. kinealyi* Minchin & Fantham 1905, and *R. equi* Zschoschke 1913.

REDAELLI (P.) & CIFERRI (R.). **Argomenti a favore di una sistemazione del genere 'Blastocystis' nelle Algae.** [Arguments for placing the genus '*Blastocystis*' among the Algae.]—*Boll. Ist. sieroter. Milano*, xv, 3, pp. 154–170, 7 figs., 1936. [German summary. Received April, 1937.]

In this paper the authors give a full account of their morphological and cultural observations on which they base their view that the genus *Blastocystis* should be included in the Protothecaceae beside the achlorophyllaceous algae [*R.A.M.*, xv, p. 94].

SCHILLING (C.) & SANTONI (D. A.). **Über Blastozystis.** [On blastocystis.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxvii, 5, pp. 293–298, 6 figs., 1936.

As a result of their studies on the blastocysts occurring as commensals in the rectum of the frog, the writers conclude that the process interpreted by Redaelli and Ciferri as sexual fusion is merely the final phase of division, and hence their proposed transference of *Blastocystis* to a section of the algae close to *Prototheca* [see preceding abstract] cannot be maintained.

DAVIS (B. H.). **The Cercospora leaf spot of Rose caused by Mycosphaerella rosicola.**—Abs. in *Phytopathology*, xxvii, 2, p. 137, 1937.

In the course of studies on the *Cercospora* leaf spot of roses at Ithaca, New York, an ascigerous stage was detected in overwintered leaves, and shown by mono-ascospore isolations and inoculations to be the perfect phase of *C. rosicola* [*R.A.M.*, xii, p. 612]. The fungus shares the generic characters of *Mycosphaerella* but does not agree with any of the described species, so a new combination [new species], *M. rosicola* (Pass.) is proposed [without a diagnosis]. The pathogenicity of the fungus (to *Rosa* spp. and varieties only) was confirmed by inoculation experiments.

Of the nine names applied to *C.* spp. on rose, only two were found on comparative study to be really distinct, viz., *C. rosae* (Fckl) von Höhn. [cf. *C. rosae* van Hook: ibid., ix, p. 37] unknown in the United States, and the ubiquitous *C. rosicola*. Among the specimens at the Cornell

University herbarium was a *Cercospora* from Savannah, Georgia, further material of which was secured from Florida. This species, differing from the two above-mentioned and occurring only in the southern States, is named *C. puderii* n. sp. [without a diagnosis].

McCulloch (Lucia). **An Iris leaf disease caused by Bacterium tardicrescens n. sp.**—Abs. in *Phytopathology*, xxvii, 2, p. 135, 1937.

Iris leaves are attacked by a yellow, Gram-negative, non-acid-fast bacterium with inconspicuous capsules, motile by a single polar flagellum and making slow and frequently erratic growth, to which the name *Bacterium tardicrescens* n. sp. is applied. The organism produced extensive, irregular, translucent, dark green (later yellow to brown) lesions but requires conditions of prolonged moisture for serious infection.

McWhorter (F. P.). **Didymellina poecilospora, n. sp., a semi-parasitic Heterosporium on bulbous Iris.**—Abs. in *Phytopathology*, xxvii, 2, pp. 135–136, 1937.

The overwintering leaves of bulbous iris in the Pacific Northwest are commonly discoloured by a *Didymellina* forming a conidial stage entirely distinct from *Heterosporium gracile* [*D. macrospora*: *R.A.M.*, xv, p. 99]. The species under observation forms abundant conidia only in freshly infected material, the blackening of the foliage being due to profuse perithecial development. The perithecia are identical with those of *D. iridis* [ibid., viii, p. 382] except in size, with ascospores averaging 25 by 6 μ. On the host the conidia are typically bicellular, measuring 12 to 38 by 6 to 9 μ; under humid conditions (natural or artificial) these organs proliferate and assume a *Cladosporium*-like habit. The name *D. poecilospora* n. sp. [without a diagnosis] is proposed for this relatively mild pathogen.

Calvino (Eva M.). **'Mal della rama' e 'mal del colletto' del Garofano.** [Stem and collar rots of Carnation.]—*Costa azzur. agric.-flor.*, xvii, 3, pp. 72–74, 1937.

Brief, popular notes are given on the symptoms and control of two carnation diseases found on the Italian Riviera, viz., stem rot caused by species of *Fusarium* (chiefly *F. dianthi*) [*R.A.M.*, xvi, p. 183] and collar rot due to *Rhizoctonia* [*Corticium*] *solani* [ibid., xi, p. 125; xv, p. 654]. Control of the former disease includes the use of resistant varieties, such as Fontmerle and Giovinezza. Carnations attacked by the latter fungus die within a few days. Infection chiefly occurs in May and June in the seed-beds or just after transplanting, but the disease is not common. Control consists in the removal of infected material and soil disinfection.

Calvino (Eva M.). **Septoria exotica, specie nuova per l'Italia.**—*Costa azzur. agric.-flor.*, xvii, 1, pp. 4–5, 1937.

In July, 1936, an entire planting of *Veronica bulkeana* in a garden in Italy suddenly wilted as a result of infection by *Septoria exotica*, not previously recorded from that country. Many of the leaves developed dry, brown spots and withered, the lesions subsequently turning white

in the centre and brown at the periphery; the white part, which measured 1 to 2 mm. in diameter, frequently fell out. The mature spores were uniseptate and measured 20 to 27 by 2 μ. Satisfactory control was given by the destruction of fallen leaves and spray applications with 1 per cent. Bordeaux mixture or 0·1 per cent. 'cerere' (tricresol-mercury acetate), the latter product being expected to be placed on sale in the spring of 1937. [An abstract of this paper appears in *Riv. Pat. veg.*, xxvii, 1–2, p. 23, 1937.]

Harrar (J. G.). **Cercospora leaf spot of Calendula.**—Abs. in *Phytopathology*, xxvii, 2, p. 130, 1937.

A leaf spot of *Calendula* spp. due to *Cercospora calendulae* Sacc. was first observed in Virginia in 1933 and increased in severity during the next two years. The fungus attacks plants of four weeks old and upwards, gaining ingress through the stomata. Infection progresses rapidly, frequently destroying the plants before flowering. The organism is conveyed through the air and soil, but apparently not by way of the seed. No evidence of resistance among 17 varieties was forthcoming. Monospore cultures of the fungus on several media yielded copious mycelial growth but no conidia. Control was effected by means of sulphur dust, lime-sulphur, Bordeaux, and copper oxide sprays.

P[ark] (M.). **A new disease of the Dahlia.**—*Trop. Agriculturist*, lxxxviii, 2, pp. 121–124, 1 pl., 1937.

In notes accompanying this reprint of G. H. Pethybridge's account of dahlia smut (*Entyloma dahliae*) [*R.A.M.*, viii, p. 244; xv, p. 370; xvi, p. 18] it is stated that the disease has recently been found in a garden in Kotmale, Ceylon. Under Ceylon conditions spray applications would be required throughout the year to ensure control if the disease once became established.

Meuli (L. J.). **Cladosporium leaf blotch of Peony.**—*Phytopathology*, xxvii, 2, pp. 172–182, 3 figs., 1937.

Cladosporium paeoniae, the agent of leaf blotch of peony [*R.A.M.*, viii, p. 293], produces dull chestnut-brown patches of irregular extent on the lower surfaces of peony leaves and a glossy, dark purple discoloration of the upper sides, and elongated, reddish-brown, later darkening, somewhat depressed streaks on the young green stems. Infection spots are abundant at branch and petiole bases, where diseased material may lodge and become a source of contamination or furnish a suitable environment for the establishment of the fungus. No hyphae were observed beneath the epidermal layers of the growing foliage, though in dead, infected leaves collected from the field the tissues were extensively invaded either by *C. paeoniae* itself or by secondary pathogens, including *C. herbarum*; the former is evidently at most only slightly parasitic.

C. paeoniae grew well on malt agar and other solid and liquid media, notably yeast-infusion glucose with 10 per cent. peony decoction. The round or lemon-shaped conidia constituting the bulk of the branching chains measure 6·4 by 3·7 μ, while the relatively few continuous or uniseptate, ellipsoid spores are 11·9 by 4 and 16·5 by 5·4 μ, respectively.

Positive results were given by the inoculation of healthy peony seedlings with a monoconidial suspension of the fungus which was consistently re-isolated from the infected tissues.

The first foliar infections were observed shortly before blossoming, the twigs and petioles being attacked several days later. The advance of the fungus was slow, and the vitality of the plants was not conspicuously impaired even by severe stem lesions. Conidia were formed in nature only under the unfavourable moisture conditions provided by late autumn and spring rains. In moist chambers profuse sporulation occurred at 70 and 90 per cent. humidity, whereas few conidia were formed in the presence of 50 per cent. moisture. The mycelium was found to overwinter in a dormant stage and produce conidia after more than a year. The conidia are disseminated chiefly by meteoric water but ants, commonly feeding on peony buds at the time of infection, probably assist in their conveyance from one part of the plant to another.

In a Madison nursery, the slender-leaved *Paeonia tenuiflora* remained entirely resistant to infection by *C. paeoniae*, which was particularly severe on the Oshkosh White, Felix Crousse, and Livingstone varieties, while sparing Gigantea and Humei Carnea. Promising results were given by burning the diseased foliage in the autumn and by the transference of clean roots to non-infested areas. Some degree of control was also obtained by the application to the leaves in the late spring of 3–2–50 Bordeaux mixture at the rate of 25 l. per acre.

WEBER (ANNA). **Sygdomme og skadedyr paa Chrysanthemum.** [Chrysanthemum diseases and pests.]—Reprinted from *Beretn. dansk. Chrysanthemum Selsk. Virksomh. 1936*, 11 pp., 9 figs., [? 1937].

Brief, popular notes, accompanied by a useful key, are given on the occurrence and control of chrysanthemum diseases and pests in Denmark, the former including *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, ix, p. 786], *Septoria chrysanthemella* [ibid., viii, p. 175], *Puccinia chrysanthemi* [ibid., xv, p. 583], *Oidium chrysanthemi* [or *Erysiphe cichoracearum*: ibid., vi, pp. 164, 298, 305; xv, p. 583], and *Botrytis* sp.

OYLER (ENID) & BEWLEY (W. F.). **A disease of cultivated Heaths caused by Phytophthora cinnamomi Rands.**—*Ann. appl. Biol.*, xxiv, 1, pp. 1–16, 2 pl., 1937.

This is a fully tabulated account of the authors' investigations, comprising a discussion of the morphology and taxonomy of the causal organism of the disease of the cultivated heaths (*Erica hiemalis*, *E. nivalis*, and *E. willmoreana*) due to *Phytophthora cinnamomi* in England, a somewhat condensed report of which has been noticed from another source [*R.A.M.*, xv, p. 655].

SCHMIDT (H.). **Eine noch zu wenig beachtete Krankheit der Cyklamen.** [An as yet too little heeded Cyclamen disease.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 5, pp. 50–51, 1 fig., 1937.

A semi-popular note is given on the brown root rot of *Cyclamen* [*persicum*] caused by *Thielavia* [*Thielaviopsis*] *basicola* [*R.A.M.*, xv, p. 536], which is stated to be responsible for heavy damage in the

Pillnitz district of Saxony and elsewhere in Germany and resists the usual control measures. Soil sterilization appears to be the most promising of those tested but further experiments are necessary to determine the correct mode of application.

Nicolas (G.) & Aggéry (Berthe). **Une maladie bactérienne du Cyclamen de Perse.** [A bacterial disease of the Persian Cyclamen.] —*C.R. Soc. Biol., Paris*, cxxiv, 5, pp. 411–414, 1937.

Early in January, 1937, the writers' attention was drawn to a disease of two-year-old hothouse *Cyclamen persicum* plants at Toulouse, characterized by irregular, yellow, mostly marginal foliar lesions, surrounded by a greenish-yellow border. The petioles may also be involved and collapse, dragging the withered leaves down to the soil, where they rapidly become covered with *Botrytis*. The diseased foliage is abnormally thick and parchment-like. The numerous flowers attempted in 1936 had shrivelled before opening and remained attached to the tubercle by their short peduncles, while the few blossoms of the current season were also largely abortive. The symptoms were much more marked at a temperature of 18° to 20° C. than in the cooler houses.

In some respects the foregoing features recall those of the disease caused by *Gloeosporium cyclaminis* [*R.A.M.*, xv, p. 657], but there was no trace of this organism in the infected tissues of the leaves, petioles, flowers, and tubercles, which teemed, on the other hand, with coccoid bacteria, 0·6 μ in diameter, occurring in groups of two or three, staining vividly with gentian violet and methylene blue, Gram-negative, and forming dark cream-coloured, glistening colonies on agar. Longitudinal sections through the rootstock revealed the presence of pinkish-brown streaks extending from the top through the vascular bundles but not reaching the base; both the wood vessels and the adjacent parenchyma were occluded by viscous masses of bacteria. Positive results were obtained in inoculation tests on a healthy plant. Natural infection is believed to be effected by bacteria from the soil penetrating the leaves by way of the stomata on the under side and thence passing to the petiole, the rootstock, and finally to the roots, where they are, however, less abundant.

Curtis (J. T.). **Non-specificity of Orchid mycorrhizal fungi.**—*Proc. Soc. exp. Biol., N.Y.*, xxxvi, 1, pp. 43–44, 1937.

Of 33 isolations of *Rhizoctonia* made from native Wisconsin orchids [cf. *R.A.M.*, xv, p. 170], at least 16 are stated to be morphologically distinct. All the strains possess the typical 'spore forms' described by Bernard (*Ann. Sci. nat., Bot.*, ix, p. 1, 1909) for the *R.* species collected on tropical and European orchids; one also develops a perfect stage with basidia, but its exact taxonomic position has not yet been determined.

A correlation appears to exist rather between ecological habitat and fungus type than between host species and fungus. For instance, *Habenaria leucophaea* from a tamarack [*Larix laricina*]-sphagnum bog was infected by a different strain of *R.* from that occurring on the same species in an open prairie, while conversely, four other orchids from the same bog, *H. dilatata*, *H. hyperborea*, *H. lacera*, and *Pogonia ophioglossoides*, harboured an *R.* strain morphologically identical with that

from *H. leucophaea*. In another case, three widely separated orchid species, *Goodyera pubescens*, *H. psycodes*, and *Liparis liliifolia*, growing in and on the sides of a rocky, pine-covered ravine, all bore the same fungus.

The extent of this non-specific infection is apparent from the number of distinct strains infecting the same orchid in various parts of the State. Thus, three *R.* strains were isolated from *Spiranthes cernua*, three from *P. ophioglossoides*, and four from *H. leucophaea*, while the last-named actually harboured two entirely different strains at opposite ends of the same root piece. Not only were morphologically distinct *R.* strains found in the same plant, but striking physiological differences were also observed.

These observations are at variance with the assumptions of Bernard and Burgeff [*R.A.M.*, xvi, p. 115] as to the indispensability of a specific mycorrhizal fungus to a given orchid, and suggest rather that the connexion is primarily determined by ecological factors.

Servazzi (O.). **Sulla biologia di Pestalotia macrotricha Kleb.** [On the biology of *Pestalozzia macrotricha* Kleb.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 5–6, pp. 72–92, 2 pl., 1936.

In this study on *Pestalozzia macrotricha* from *Kalmia latifolia* [*R.A.M.*, xiv, p. 608] in Italy the author states that the conidia on this host are somewhat atypical compared with those occurring on *Rhododendron*, on different species of which it is widely prevalent in that country. The atypical conidia differ from the typical in the number and length of the setae (2 or 3 against 2 to 4, usually 3, and 17 to 27 μ against 25 to 40 μ) and to some extent in colour. Conidia from natural infections of *K. latifolia*, when cultured in Raulin's medium, gave rise at first to atypical conidia, but in the fourth generation to typical conidia, showing that both forms belong to the same fungus which was able to adapt itself to various species of the Ericaceae-Rhododendreae. In culture the atypical form developed larger, darker, and longer conidia the less nutrient there was in the medium, and at certain concentrations of the nutrient pycnidia and pseudopycnidia were formed instead of acervuli.

Inoculations made with suspensions of typical conidia on young and adult *K. latifolia* and *Rhododendron maximum* leaves, without wounding, gave positive results (diffused infection) only when the inoculation site was at the leaf base. The experiments demonstrated that the fungus is a weak parasite. On young inoculated leaves of both hosts pycnidia and occasionally pseudopycnidia developed, while on adult inoculated leaves of both hosts acervuli (and occasionally pseudopycnidia) developed. Both typical and atypical conidia were found on the inoculated *K. latifolia* leaves, while on the *R. maximum* leaves typical conidia were found almost exclusively. A study of the enzymes liberated by the fungus showed the presence of lipase, saccharase, trehalase, emulsin, amylase, urease, allantoinase, and phenolase either as exo- or endo-enzymes.

Jones (D. J. C.). **Important fungoid diseases of grass turf.**—*Parks, Golf Courses & Spts Grnds*, ii, 5, pp. 128–129, 1937.

Brief notes are given on the symptoms and control of a number of

diseases of turf [in England]. Damping-off of young grass seedlings (*Cladochytrium graminis*) [? *C. caespitis*: *R.A.M.*, xiii, p. 520] occurs as small, yellow spots on the lawn which under favourable temperature and moisture conditions rapidly affect the whole surface, sometimes necessitating re-sowing. Mild attacks, however, have only a temporary effect, and spread may be checked by dry weather. *Agrostis* seedlings are readily susceptible to the fungus. The affected areas should be treated with Cheshunt compound (1 oz. per 2 galls.).

Snow mould (*Fusarium nivale*) [*Calonectria graminicola*: ibid., xv, pp. 74, 706] generally occurs under cold, moist conditions. It is favoured by acid soil, and turf treated with excessive amounts of sulphate of ammonia is liable to recurrent attacks.

The brown or bleached patches due to *Corticium fuciforme* [ibid., xv, pp. 102, 706] are less definitely outlined than those caused by *Calonectria graminicola* and the disease is less serious. As the fungus may remain dormant in the soil, infected turf should be treated at once with an organic mercury compound, Bordeaux mixture, or malachite green.

Brown patch (*Rhizoctonia* spp.) [chiefly *Corticium solani*: ibid., xv, pp. 102, 445, 706] is less prevalent in Great Britain than in America.

DALLAS (W. K.). **Spray schedule for control of principal orchard diseases and pests.**—*N.Z. J. Agric.*, liv, 1, pp. 15–24, 1937.

Spray schedules with notes are given for a number of diseases of fruit trees in New Zealand, including apple black spot [scab] and powdery mildew [*Venturia inaequalis* and *Podosphaera leucotricha*: *R.A.M.*, xvi, p. 262], pear scab [*V. pirina*: ibid., xvi, p. 187], peach leaf curl [*Taphrina deformans*: see below, p. 473], and peach brown rot and rust [*Sclerotinia fruticola* and *Puccinia pruni-spinosae*: ibid., xvi, pp. 264, 368]; directions are also given on the treatment of *Stereum purpureum* and avoidance of apple russet (spray injury).

HARDING (P. L.) & POWELL (C. L.). **Transportation of Apples from the Shenandoah-Cumberland section to overseas markets.**—*Tech. Bull. U.S. Dep. Agric.* 523, 26 pp., 5 figs., 2 graphs, 1936.

Apples shipped under refrigeration from different parts of the Shenandoah-Cumberland fruit-growing section of Virginia, West Virginia, Maryland, and Pennsylvania via New York to England reached their destination practically free from decay and in the best condition, whereas fruit held in ordinary stowage showed varying amounts of rot, sometimes accompanied by internal breakdown [*R.A.M.*, xvi, p. 107]. For instance, Wealthy and Bonum apples travelling from Virginia to Liverpool under refrigeration in 1931 arrived in perfect condition, while the same varieties in ordinary stowage showed, respectively, 2 to 20 and 5 per cent. decay. Refrigerated Jonathan and King Davids also arrived at Liverpool free from decay, while corresponding lots in ordinary stowage showed from 2 to 5 per cent. rot. In another test Lowry, Delicious, and Jonathan apples from Maryland subjected to refrigeration on board ship arrived in good market condition in London, while the lots in ordinary stowage contained, respectively, 10 to 15, 2 to 6, and 1 per cent. decay and breakdown.

Refrigeration during rail transit from Virginia to Jersey City, New

Jersey, somewhat reduced the incidence of rot, especially in Grimes Golden, but did not significantly retard the rate of softening.

HOLZ (W.). **Einfluss des Lichtes auf die Perithezienbildung von Venturia inaequalis Aderhold.** [The influence of light on perithecial formation by *Venturia inaequalis* Aderhold.]—*Zbl. Bakt.*, Abt. 2, xcv, 21–26, pp. 469–471, 5 figs., 1937.

Perithecia of *Venturia inaequalis* on apple leaves [see next abstracts] kept in the dark assumed a variety of abnormal shapes; in some cases several necks were formed but the viability of the ascospores did not seem to be impaired. The admission of small amounts of light (20 minutes' daily illumination) promoted normal perithecial development, and even one weekly exposure of the same duration sufficed to induce the formation of organs differing from the characteristic type only in their profuse development of setae.

Jahresbericht der Preussischen landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe) Berichtsjahr 1. April 1935 bis 31. März 1936. [Annual Report of the Prussian Agricultural Experiment and Research Stations at Landsberg (Warthe) for the administrative year from 1st April, 1935 to 31st March, 1936.]—*Landw. Jb.*, lxxxiv, 1, pp. 95–125, 1 fig., 1 diag., 1937.

In the section of this report (pp. 95–102) dealing with the investigations of G. O. Appel and his collaborators at the Phytopathological Institute of the Landsberg Experiment Station [cf. *R.A.M.*, xv, p. 479], an account is given of a study by K. Küthe on physiologic specialization in apple scab (*Venturia inaequalis*) and on the critical period for the application of fungicidal sprays [ibid., xvi, p. 188]. In greenhouse inoculation experiments strain A 124 of the fungus, originating on the Edel variety, attacked only Edel in one test, Edel and Ananas Pippin in another, and finally infected all the varieties used in the trials. It is thus evident that the organism, while finding certain varieties more congenial than others, will attack a wide range under appropriate conditions. In experimental weekly sprayings with Bordeaux mixture on Golden Pearmain carried out on 18th and 25th April and 2nd May, the second was the most efficacious, resulting in a crop of 47·1 per cent. completely healthy fruit and only 0·2 per cent. severe scab, the corresponding figures for untreated being 6·1 and 1·7 per cent., respectively, for those sprayed on 18th April 21·6 and 0·5 per cent., and for those treated on 2nd May 4·5 and 5·8 per cent. The explanation of the absolute inutility of the third application lies in the fact that the ascospores had already been liberated, the discharge reaching its maximum intensity on 28th April. These data are considered to afford further confirmation of the decisive part played by the ascospores in primary infections by *V. inaequalis* [ibid., xv, p. 375], at any rate under local climatic conditions. Isolated cases of primary conidial infection have also been observed, but in general these organs serve merely for the perpetuation of the fungus on a given tree [see next abstract]. The lack of agreement between the reports of different workers with identical fungicides are also explained by discrepancies in the time of treatment.

Gloyer (W. O.). **Evaluation of the Geneva experiment on scab control.**—Abs. in *Phytopathology*, xxvii, 2, p. 129, 1937.

In the course of a seven-year investigation at Geneva (New York) on the value of lime-sulphur (1 in 40) in the control of apple scab [*Venturia inaequalis*: see preceding and next abstracts] and on the effects of the fungicide on certain physiological processes and disorders of the host [*R.A.M.*, xv, p. 727], overwintering conidia were observed to be of greater importance in the initiation of infection than is generally believed [see preceding abstract]. Dormant branches, forced and incubated in the greenhouse, bore conidia on the scale leaves. The spread of overwintering conidia is apparently favoured by heavy rain ($\frac{1}{2}$ in. or more) in the delayed-dormant stage. The disease was controlled by three applications when spraying operations commenced with either the delayed-dormant, pre-blossom, or calyx spray. The fungicide in the cover sprays prevented autumn infection of the lower leaf surfaces.

Keitt (G. W.) & Palmiter (D. H.). **Eradicant fungicides in relation to Apple scab control.**—Abs. in *Phytopathology*, xxvii, 2, p. 133, 1937.

In small-scale autumn spraying experiments [in Wisconsin], the application of certain copper-lime-arsenite preparations [*R.A.M.*, xiv, p. 381] to apple trees reduced the incidence of perithecia of *Venturia inaequalis* [see preceding abstracts] the following spring by 99 to 100 per cent. without seriously injuring the host. A spring application of a solution of ammonium sulphate (1 lb. per gall.) to overwintered leaves on the ground destroyed the mature ascospores of the fungus and arrested its further development. In an orchard, sprayed in the autumn of 1935 with copper-lime-arsenite mixtures, overwintered leaves averaged 5 perithecia per sq. in. compared with 255 in an untreated orchard 300 ft. distant. Neither orchard was sprayed in the summer of 1936. The following percentage reductions were determined by counts in the incidence of scab lesions in the autumn-sprayed orchard: Wealthy leaves, 2nd June 99, 6th July 87; Northwestern Greening leaves, 4th June 94, 9th July 85; Wealthy fruit, 10th July 87, 2nd September 75. On 2nd September, there was 55 per cent. diseased Wealthy fruit in the sprayed orchard compared with 99 per cent. in the untreated.

Carne (W. M.) & Martin (D.). **Preliminary experiments in Tasmania on the relation of internal cork of Apples and cork of Pears to boron deficiency.**—*J. Coun. sci. industr. Res. Aust.*, x, 1, pp. 47–56, 1 fig., 1937.

The exchange of affected apples between Tasmania and New Zealand showed that corky pit in the latter country is symptomatically the same in the same varieties as internal cork in Tasmania [cf. *R.A.M.*, xvi, p. 388]. The same disorder has been variously known as internal cork in Australia, corky pit in New Zealand, cork in the United States, and from the superficial lesions as drought spot in the United States and Canada. Corky core is a specialized form of internal cork affecting only the core and found typically in Jonathan apples. Typical drought spot has not been recorded in Australia.

The reduction of growth and the failure of leading stems to maintain their upward growth, malformed shortened shoots, and the death of

shoots have been associated under the name 'die-back' with internal cork, and are probably partly due to the same cause.

In Tasmania internal cork affects Sturmer and Granny Smith, which frequently show fruit malformation, while in Pomme de Neige, Duke of Clarence, and Jonathan, fruit malformation is less usual; French Crab, Delicious, Dunns, and Cleopatra are less susceptible, but show malformation or dimpling of the fruit, without internal lesions; Crofton and Democrat are nearly or quite resistant.

In preliminary trials soil dressings of 3 lb. boric acid per tree completely controlled internal cork of apples, but caused some injury on light soils and to small trees. Injections of 1 to 2 l. of 0·25 per cent. boric acid solution were completely effective in all parts of the tree when made in one fork of the trunk; slight leaf injury was caused in the branches immediately above the injection. The insertion of 0·5 or 1 gm. boric acid (either loose or in a gelatine capsule) in a $\frac{1}{2}$ in. auger hole in a main branch or the trunk affected only the branches immediately connected with the hole.

The dimpling of Cleopatra apples and cork in pears [ibid., xii, p. 769] did not respond to the treatments, and it is thought that the causes of these troubles may be different from those of internal cork in apples.

Burrell (A. B.) & Miller (H. J.). **Boric acid treatment of a physiogenic Apple disease.**—Abs. in *Phytopathology*, xxvii, 2, p. 123, 1937.

Immediately after petal fall, 0·75 to 2 gm. boric acid crystals were injected through a single hole, $\frac{7}{16}$ in. in diameter, in the crown of each of 12 young McIntosh and Fameuse apple trees affected [in the Lake Champlain Valley, on the New York–Vermont boundary] by a complex disorder manifested by symptoms of drought spot, cork, rosette [stated by the first-named author in an accompanying paper to be distinct from the zinc-responsive rosette of the western United States: *R.A.M.*, xvi, p. 259], and die-back [ibid., xii, p. 769 and preceding abstract]. At the time of treatment, these trees had 1,335 rosette twigs, of which 92·4 per cent. resumed normal growth within six weeks, the corresponding figures for 7 trees with 866 diseased twigs receiving zinc sulphate flakes, and for 6 controls with 769 affected twigs being only 2 and 1·4 per cent., respectively. On 10th August, incipient die-back was observed on 1·1 twigs per boric acid-treated tree, 60·4 of those given zinc sulphate, and 65·5 of the controls, the corresponding figures for abnormal second growth being 2·2, 23·3, and 20·2 per cent., respectively. Dry boric acid caused appreciable injury round the site of injection but no damage to the leaves, while zinc sulphate adversely affected both parts. The introduction of boric acid into mature trees gave promising but inconclusive results. The injection of 5 per cent. boric acid solution was highly detrimental, whereas at 1 per cent. the treatment was usually well tolerated.

Johnson (J. C.) & DeLong (W. A.). **Boron content of Apples at different stages of development.**—*Plant Physiol.*, xii, 1, pp. 219–220, 1937.

The results of periodical tests during the 1934 growing season, made on healthy apple fruits of the Golden Russet variety in Nova Scotia,

showed that in this fruit the boron content progressively increased throughout the season, the increase being relatively very rapid during the period of cell division and rapid growth (June), after which the rate of accumulation of this element slowed down considerably but persisted up to the normal harvest time. The boron : dry weight ratio, however, decreased fairly rapidly during June and July, after which it remained practically constant. These observations are considered to emphasize the apparent importance of boron during the period of rapid growth of the apples.

Moreau & Vinet. **Carpocapse et tavelure. Dates des traitements des arbres fruitiers dans le Val de Loire.** [*Carpocapsa* and scab. Dates for treatments of fruit trees in the Val de Loire.]—*C.R. Acad. Agric. Fr.*, xxiii, 6, pp. 190–195, 1937.

William pears should be treated against scab [*Venturia pirina*] in the Val de Loire with 1 per cent. Bordeaux mixture, the first application being made before the opening of the floral buds (8th April in 1935, 26th March in 1936), the second at petal fall (24th and 17th April, respectively), and the third three weeks to a month later (about 15th May) [*R.A.M.*, xv, p. 735]. Where scab and *Carpocapsa* [*Cydia pomonella*] are to be jointly combated, the Bordeaux mixture should be supplemented by lead arsenate (0·5 to 1 kg. per hectol.). An omission of the first treatment may lead to a serious reduction in the efficacy of the treatment.

Herbst (W.). **Venturia pirina Aderhold. II. Die Abhängigkeit der Formenverbreitung von meteorologischen Faktoren.** [*Venturia pirina* Aderhold. II. The dependence of form distribution on meteorological factors.]—*Gartenbauwiss.*, xi, 1, pp. 35–53, 5 figs., 2 diags., 1 graph, 1 map, 1937.

The existence of polymorphism in the agent of pear scab (*Venturia pirina*) having been demonstrated by previous studies [*R.A.M.*, xvi, p. 45], an attempt was made to solve the problem of the variations in the 'population' composition of a number of German collections of the fungus, over 3,000 monospore cultures of which were examined, taking the Geisenheim 'population' as a criterion. Actual linear distance from Geisenheim was found to be only a subsidiary factor in the discrepancies between the constitutions of the various local collections, meteorological influences, especially the direction of the prevailing winds (north-east and south-east in the Geisenheim district), playing a decisive part in the distribution of the various forms. The course of a cyclone affords a graphic illustration of the method of spore distribution, the deep depression in its van creating the necessary conditions for the ejection of the ascospores, which are then disseminated primarily by the north-westerly side currents in its wake. A south-easterly spore drift may thus in general be expected to provide the maximum influx of inoculum, a statement that must naturally be modified by a consideration of local topographical factors, such as the protection from spore invasion afforded by mountains, forests, and the like. In this connexion more intensive studies of bioclimatic factors are urged in relation especially to the epidemiological branch of plant protection. It is thought to be

probable that many other wind-distributed parasites are governed by similar laws to those operating in the case of *V. pirina*.

HILDEBRAND (E. M.) & HSIONG (S. L.). **Inheritance of plant characters and resistance to fireblight in Pear.**—Abs. in *Phytopathology*, xxvii, 2, p. 131, 1937.

In the hope of finding a basis for the breeding of pears resistant to fireblight [*Erwinia amylovora*: *R.A.M.*, xvi, p. 391], the writers examined the reciprocal crosses between a number of standard varieties at the New York (Geneva) Experiment Station. The transmission to the progeny of certain plant characters, e.g., leaf size and serration, fruit quality, and stem thickness, was found to be correlated in the relatively resistant varieties, Kieffer and Seckel, with the heritability of blight resistance, as gauged by the percentage of positive inoculations and the length of lesion produced.

IVANOFF (S. S.) & KEITT (G. W.). **Aerial bacterial strands in fireblight.**—Abs. in *Phytopathology*, xxvii, 2, p. 132, 1937.

Hair-like, curved, usually colourless, glistening aerial strands, composed of cells of *Erwinia amylovora* [see preceding abstract and below, p. 482] and measuring a fraction of a millimetre to several centimetres by 8 to 45 μ were observed on pear blossoms, young fruits, and shoots inoculated with the pathogen and were subsequently produced experimentally under greenhouse and field conditions [in Wisconsin] in the spring of 1936. They disintegrate immediately in water and slowly in glycerine, releasing large numbers of viable and infectious bacteria. These strands appear to represent a special form of the well-known bacterial exudate, their component materials originating in the internal diseased tissues and emerging at the surface through minute apertures. They are easily broken off and disseminated by wind.

DIPPENAAR (B. J.). **Cause and control of heat spot of Plums.**—*Fmg S. Afr.*, xii, 131, pp. 83–85, 1937.

Continuing his studies on the etiology and control of 'Kelsey' (better designated 'heat') spot of plums in Cape Province [*R.A.M.*, xv, p. 34], the writer confirmed previous observations as to the causation of the disturbance by excessively high internal fruit temperatures (74·7° to 120·7° F.) on abnormally hot days in the orchard. The best control of the condition was obtained by the application to the soil round the trees of a fertilizer mixture of superphosphate, potash, and nitrogen, the costs of which, however, are regarded as unjustifiably heavy for the object in view.

ZELLER (S. M.). **Controlling Peach leaf curl.**—*Bett. Fruit*, xxxi, 7, pp. 16–17, 1 fig., 1937.

The most prevalent and destructive disease of peaches in the humid sections of the Pacific Northwest and probably wherever the peach is grown in this locality is leaf curl (*Taphrina deformans*) [*R.A.M.*, xv, p. 234; xvi, pp. 389, 393]. In equally susceptible varieties of peaches, differences in earliness may influence severity of attack. The Elberta peach, some of the Clings, Columbia, Crawfords, and Muir are susceptible

in a diminishing scale in this order. In Oregon the disease if uncontrolled will ruin an entire orchard in two or three years. Thorough spraying with Bordeaux mixture (6–6–50) should be carried out not later than December. The addition of sugar (1 oz. per 100 galls. of spray) will prevent deterioration of the spray for a few weeks.

SHERBAKOFF (C. D.) & ANDES (J. O.). **Peach diseases and their control in Tennessee.**—*Bull. Tenn. agric. Exp. Sta.* 157, 11 pp., 1936. [Received April, 1937.]

Brief, popular notes are given on the symptoms and control of the more important peach diseases and insect pests in Tennessee, including brown rot [*Sclerotinia fructicola*: *R.A.M.*, xvi, p. 264], leaf curl [*Taphrina deformans*: see preceding abstract], scab [*Cladosporium carpophilum*: ibid., xv, p. 235], and bacterial leaf spot [*Bacterium pruni*: loc. cit.]. A dormant spray (lime-sulphur 1–7, Bordeaux mixture 2–4–50 with 3 or 4 per cent. oil, or creosote oil 2 per cent. with 3 per cent. oil emulsion) is always necessary for leaf curl and scale insect control. Four summer sprays are recommended (at the 'shuck' stage for insects only, a fortnight later, June, and July, respectively), with a petal-fall sulphur spray in addition if blossom infection by *S. fructicola* is expected, and one or more pre-harvest applications of sulphur after July if conditions favour brown rot of the fruit. Sulphur sprays should be applied early against scab and wettable or flotation sulphur may be used in place of dry-mix. The use of a combination consisting of 4 lb. zinc sulphate and 4 lb. hydrated lime per 50 galls. water, with lead arsenate, decreases the injurious effects of the lead arsenate and defoliation due to bacteria.

ROSE (D. H.), FISHER (D. F.), BROOKS (C.), & BRATLEY (C. O.). **Market diseases of fruits and vegetables: Peaches, Plums, Cherries, and other stone fruits.**—*Misc. Publ. U.S. Dep. Agric.* 228, 27 pp., 11 pl. (6 col.), 1937.

This publication is a revised, elaborated version of a handbook issued in 1919 for the use of food-products inspectors. Notes are given on the occurrence, symptoms, effects, and control of the following fungal rots of stone fruits besides various types of injury, viz., green mould rot of cherries (*Alternaria* sp.) [*R.A.M.*, iv, p. 176], bacterial rot (*Bacterium pruni*), black mould rot of peaches and cherries (*Aspergillus niger*), blue mould rot (*Penicillium* sp.) and brown rot (*Sclerotinia fructicola*), California blight (*Coryneum beijerinckii*) [*Clasterosporium carpophilum*: ibid., xvi, p. 393], green mould rot of sweet cherries, peaches, and plums, due to a *Cladosporium* other than that causing scab of stone fruits [*C. carpophilum*], grey mould rot (*Botrytis ? cinerea*), powdery mildew (*Sphaerotheca pannosa* var. *persicae*) on peaches [ibid., vi, p. 123] and nectarines, *Rhizopus* rot (*R. nigricans* and possibly other species), and leaf curl (*Exoascus* [*Taphrina*] *deformans*) of peaches [see preceding abstracts] and nectarines occasionally found affecting market fruit, rust (*Tranzschelia* [*Puccinia*] *pruni-spinosae*) [ibid., xvi, p. 468], and scab (*C. carpophilum*) besides internal browning of peaches (not in cold storage) resembling cork in apples, and various injuries.

RIETSEMA (I.). **De mosaiekziekte der Frambozen.** [The mosaic disease of Raspberries.]—*Fruitteelt*, xxvi, 12, pp. 206–212, 1936.

Following a general discussion on varietal reaction to raspberry mosaic in Holland [*R.A.M.*, xii, p. 705], the writer gives a brief account of his experiments in the development of resistant strains by hybridization. Excellent results were obtained by crossing a strain of the susceptible Haagsche Bruin variety with one of the selfed family 112 and plans have been made for the multiplication of the progeny.

PLAKIDAS (A. G.). **The rosette disease of Blackberries and Dewberries.** —*J. agric. Res.*, liv, 4, pp. 275–303, 8 figs., 1 graph, 1937.

A full account is given of the author's studies of the rosette disease of blackberries and dewberries (*Rubus* spp.) [*R.A.M.*, xiii, p. 786], which is stated to occur, so far as known, only in the southern and south-eastern parts of the United States, from New Jersey to south-east Texas, and from southern Illinois to the Gulf of Mexico. The causal fungus, originally named *Fusisporium rubi* by Winter and transferred to *Ramularia* as *R. rubi* by Wollenweber, is renamed *Cercosporella rubi* (Winter) comb. n. with a revised technical description. In cultural studies the organism was shown to grow readily on a variety of media, on which it sporulates fairly well; the spores are variable in size, shape, and number of septa. The minimum, maximum, and optimum temperatures for growth in culture were found to be 6°, 30°, and 25° C., respectively. In nature, the mycelium occurs within the vegetative and flower buds of the host, but only sporulates in the spring on the open flowers. Usually the canes newly produced (primocanes) do not show external symptoms of the disease, but the following spring the infected buds form the rosette or witches' broom type of growth. While histological studies did not reveal tissue invasion by the fungus, the latter was found in close association with the embryonic bud elements, from which it is believed to derive its nourishment and thus to starve the infected buds. In infected pistils, the fungus prevents the fusion of the carpellary walls, and the stylar canal, thus left open at the base of the style, is filled with hyphal strands, which also occur inside the ovule. Experimental evidence indicated that infection may, under certain conditions, become systematic in the crowns of dewberry plants arising from tip rootings of rosetted canes, but not in the blackberry.

The pathogenicity of *C. rubi* to wild and cultivated species of blackberries and dewberries was demonstrated in repeated experiments extending from 1931 to 1934. There was evidence that in Louisiana natural infection does not usually occur after the last week in May or the first week in June, temperature being believed to be the limiting factor. The fact, however, that on the Nanticoke blackberry infection also occurs as late as in July, suggests that other factors besides temperature may have a determining influence on the time of infection.

SAUNDERSON (W. R.) & CAIRNS (H.). **On the control of Gooseberry rust.**—*Ann. appl. Biol.*, xxiv, 1, pp. 17–25, 1 pl., 1 graph, 1937.

The authors state that observations in Northern Ireland, from 1933 to 1935, inclusive, on over twenty varieties of gooseberry, representing

the three types of the fruit (red, green, and yellow), did not reveal any pronounced variation in their susceptibility to rust (*Puccinia pringsheimiana*) [*R.A.M.*, xiii, p. 173]. Details are then given of experiments from 1932 to 1934, inclusive, the results of which showed that effective control of the rust was afforded by spraying the bushes with Bordeaux mixture at concentrations of 2 (2–1·5–10), 1, and 0·5 per cent., or with a proprietary colloidal copper preparation containing 15 per cent. metallic copper, or lastly, with another proprietary colloidal sulphur preparation with 15 per cent. sulphur, the two last-named preparations being applied at 0·5 per cent. concentration. Burgundy mixture caused some defoliation and is not recommended. The tests also indicated that repeated spraying does not appreciably increase the efficacy of the treatment, provided the first application is made at the optimum time, which was found to be about two weeks after the gooseberry begins to flower. There was evidence that this moment coincides with the maximum discharge of the basidiospores of *P. pringsheimiana*, which commences with or soon after the beginning of seasonal growth of the gooseberry, and normally terminates some four or five weeks after flowering. While no attempt was made to correlate the aecidial stage of the rust on the gooseberry with sedge rust, it was noted that in the vicinity of the experimental centre at Galgorm, *Puccinia* sp. was present on four species of *Carex*, namely, *C. goodenowii*, *C. inflata*, *C. flava*, and *C. panicea*.

STAHEL (G.). **The Banana leaf speckle in Surinam caused by Chloridium musae nov. spec. and another related Banana disease.**—*Trop. Agriculture, Trin.*, xiv, 2, pp. 42–45, 4 pl., 1937.

Congo bananas growing under shade trees and along the humid edges of the jungle in Surinam are affected by a leaf speckle [cf. *R.A.M.*, xiii, p. 455; xiv, p. 427] caused by a new species of *Chloridium* which is named [without a Latin diagnosis] *C. musae* n. sp. Every leaf up to the second may develop speckled patches which enlarge and may cover nearly the whole surface, considerably reducing the effectiveness of the infected leaves. The patches are formed by numerous isolated, minute, black or brown speckles in an otherwise green part, each corresponding with an air space. In the small spots on young leaves 5 to 10 per cent. of the chambers are blackened, while in the larger areas on the oldest leaves 60 per cent. are thus affected. The specks are visible on both sides of the leaves, but are more conspicuous on the upper. The vascular bundles continue to function, the damage done being confined to the assimilating tissue.

On the under surfaces of the leaves were found dark brown conidiophores 100 to 300 μ long, 2 μ thick at the base, and about $1\frac{1}{2}$ μ thick near the tip. The terminal part was hyaline, 20 to 30 μ long, and covered with minute projections bearing hyaline, oval or ovate conidia measuring 5 to 8 by 2 to $3\frac{1}{2}$ μ, with a minute papilla at the point of attachment. Many of the conidia germinated in water in 12 hours, producing a hyaline appressorium.

The fungus grew well in culture on acid nutrient agar, forming a dark olive-green mycelium with fairly typical conidiophores and abundant normal conidia. On banana agar the mycelium formed pointed, erect, rigid rhizomorphs 4 to 6 mm. long and covered with typical

conidiophores. Conidiophores were often formed at the ends of hyphae which also produced acrogenous solitary conidia on short side branches.

Effective control resulted from regular applications of Bordeaux mixture.

Another leaf speckle found so far only on Pisang Radja bananas on sandy soil in Paramaribo is caused by a fungus named *Ramichloridium musae* n.g., n. sp. [without Latin diagnoses]. Except on the oldest leaves, on the upper side of which they appear as light green spots, the spots are visible on the under surface only, on which they form velvety, greyish to brownish mats. The conidiophores measure 200 to 500 μ long, about 3 μ thick at the base, and 2 μ near the tip and bear short branches, placed opposite or singly. The conidia are produced in the same manner as those of *C. musae*, and are of the same length, but measure only $1\frac{1}{2}$ to $2\frac{1}{2}$ μ in width.

HEUBERGER (J. W.) & ADAMS (J. F.). **Another role of zinc-lime in combination Peach sprays.**—*Trans. Peninsula hort. Soc.*, xxvi, 5, pp. 55–59, 2 figs., 1 graph, 1936. [Received April, 1937.]

Laboratory tests of the adherence and fungicidal toxicity (against *Venturia inaequalis*) [see above, p. 440] of wettable sulphurs and the wettable sulphur-lead arsenate-lime-zinc sulphate combination sprays [used against *Bacterium pruni* on peach in Delaware: cf. *R.A.M.*, xiv, p. 682] showed that the former did not adhere sufficiently while the latter were more toxic and adherent, the hydrated lime reacting with both the acid lead arsenate and the zinc sulphate to produce a heavy precipitate giving increased adherence. The flocculation of acid lead arsenate-hydrated lime in the presence of a wettable sulphur destroys the dispersion, and the sulphur particles are carried down with the flocculent precipitate, resulting in greater adhesion and toxicity per unit area of spray film.

HEUBERGER (J. W.) & ADAMS (J. F.). **The influence of lead arsenate and lime on the fungicidal toxicity and adherence of wettable sulphur sprays.**—*Trans. Peninsula hort. Soc.*, xxvi, 5, pp. 68–72, 2 figs., 1 graph, 1936. [Received April, 1937.]

Laboratory tests of the fungicidal toxicity and adherence of various commercial brands of wettable sulphur alone and in combination with acid lead arsenate and hydrated lime [see preceding abstract], as tested against *Venturia inaequalis*, showed that no germination occurred on the combination spray films on the test slides after one washing, while germination on the wettable sulphurs averaged 35·4 per cent., the corresponding figures after two washings being 0 and 63·5 per cent., respectively.

DAVIES (F. A.) & ADAMS (J. F.). **The influence of spreaders and stickers in relation to the fungicidal efficiency of insoluble copper spray films.**—*Trans. Peninsula hort. Soc.*, xxvi, 5, pp. 32–39, 2 graphs, 1936. [Received April, 1937.]

Laboratory tests of the germinations of spore suspensions of *Macrosporium* [*Alternaria*] *solani*, *Glomerella cingulata*, and *Venturia inaequalis* on sprayed slides showed that inert spreaders such as bentonite and kaolin had no effect on the fungicidal efficiency of the insoluble copper sprays, coposil [*R.A.M.*, xv, p. 706] and Z–O. However, when

wyojel [ibid., xvi, p. 197] was used instead, the efficiency of both sprays was reduced as a result of chemical interference set up by the magnesium oxide in the spreader. This interference was obviated by the addition to the spray of acid lead arsenate at the rate of 3 lb. per 100 galls. Adherence, as gauged by fungicidal activity after repeated washing, was greatest when wyojel was used, but the difference from kaolin or bentonite was so slight that only under certain conditions would it make up for the reduced fungicidal efficiency involved.

Handbuch der Pflanzenkrankheiten. Sechster Band. Pflanzenschutz. Verhütung und Bekämpfung der Pflanzenkrankheiten. [Handbook of plant diseases. Volume VI. Plant protection. Prevention and control of plant diseases.]—Lieferung 1, pp. 1–288, 3 graphs, Berlin, P. Parey, 1937. Price RM. 16.20.

In this, the first part of a volume to be published in four parts in continuation of the sixth revised edition of Sorauer's 'Handbook of Plant Diseases', issued under the general supervision of Dr. O. Appel [*R.A.M.*, xiii, p. 646], fully documented surveys of the available information brought up to date (1936) are contributed on two outstanding aspects of plant protection. In the first section H. Morstatt discusses its economic importance and in the second section the functions of plant protection are reviewed at some length, the latter being treated under the following headings: the prevention of the occurrence of plant diseases and pests by a rational system of hygiene based on improved cultural methods (H. Braun); disinfection practices, comprising soil sterilization (H. Thiem), cereal and other seed treatment (E. Riehm), and quarantine regulations (H. Braun). The issue concludes with an incompleted section by W. Trappmann on physical methods of control.

Riehm (E.). **Pflanzenschutzmittelindustrie und Vierjahresplan.** [The plant protective industry and the four-year plan.]—*Angew. Chem.*, l, 9, pp. 173–175, 1937.

In connexion with the campaign, initiated in 1935, to render Germany self-supporting within the next four years, the writer defines the two principal tasks of the plant-protective industry as (1) the replacement of foreign raw materials by indigenous substances of like efficacy, and (2) the development of effective means of control of diseases that have hitherto proved refractory to treatment.

Foreign raw materials are at present very widely used in plant protection. For example, mercury is practically indispensable in the treatment of seed-borne cereal diseases, only one (formaldehyde) of the 13 official standard preparations for the purpose [*R.A.M.*, xvi, p. 24] being free from this substance. Formaldehyde, however, is recommended only against one disease, loose smut of oats [*Ustilago avenae*], whereas the mercury preparations are of much wider application, an essential factor in large agricultural concerns such as the co-operative seed disinfection stations [loc. cit.], of which there are stated to be 233 in Westphalia, 185 in Schleswig-Holstein, and 348 in Hanover. At a conservative estimate, the annual German requirements of mercurial dusts and liquid fungicides amount to 800 and 180 tons, respectively, so that it is incumbent on manufacturers to devise formulas in which the present

maximum mercury contents of dusts and liquids are reduced from 9 and 17 to 1 and 3 per cent., respectively.

It is also urgently necessary to reduce the annual outlay on copper (7,000 to 10,000 tons copper sulphate in the vineyards and 8,000 in the orchards); this element is essential for the control of downy mildew of the vine [*Plasmopara viticola*] and of hops [*Pseudoperonospora humuli*], but is to some extent replaceable against scab [*Venturia* spp.] in the orchard by sulphur, which is obtainable in abundance in Germany. Copper sulphate will also probably continue to be necessary for the control of reclamation disease [ibid., xv, p. 145], and so far no substitute has been devised for borax, of which some 1,000 tons were applied against heart and dry rot of beets in 1936.

HANSEN (K.). **Enkelt- og Nyhedsprøver. I. Motor-Frugttræsprøjten 'Ginge'.** [Individual tests of new appliances. I. Motor fruit tree sprayer 'Ginge'.]—*Beretn. Redskabsprøv., Kbh.*, 77, pp. 1–7, 1937.

Technical details are given of the construction, mode of operation, and application of a motor orchard sprayer, 'Ginge' (H. Nielsen & Co., P. Bangsvej 34, Copenhagen), weighing 250 kg. and costing Kr. 1,200 [£66. 5. 0. at par]. The apparatus gave satisfaction in the tests to which it was submitted, and may be recommended on grounds both of efficiency and economy. One or two suggestions are made for the improvement of various accessory parts.

HARTLEY (C.) & RATHBUN-GRAVATT (ANNIE). **Some effects of plant diseases on variability of yields.**—*Phytopathology*, xxvii, 2, pp. 159–171, 3 graphs, 1937.

While the principles of phytopathology have been consistently and successfully applied to improving the quantity and quality of plant products and decreasing the cost of production, less attention has been paid to another of its functions—that of reducing the erratic annual variations of yields, which are liable to cause widespread economic complications.

Two groups of diseases differing markedly in their effects of yield variation may be distinguished, one including those promoted by conditions weakening the host, which tend strongly to enhance the annual yield variations, and the other comprising disorders favoured by factors that simultaneously stimulate host growth. Representatives of the former group are probably most numerous among the root rots and vascular diseases, e.g., *Fusarium* wilt of cotton [*F. vasinfectum*], while a striking example of the latter is furnished by late blight of potatoes [*Phytophthora infestans*], which has been reduced from a source of disastrously heavy losses to an apparently stabilizing factor, as far as regional and national (not necessarily individual) yields are concerned, by the application of standard schedules of control.

Diseases of the foregoing types are amenable to analysis by the customary statistical methods, but there are others involving the unpredictable movements of insect vectors, such as curly top of sugar beets, that depart too widely from the normal course for their effects to be adequately expressed by these means.

Some concrete illustrations are cited of the combined effects on yield

variability of two or more diseases and of disease uncertainties affecting the individual producer.

SNELL (W. H.). **Three thousand mycological terms.**—*R.I. bot. Club Publ.* 2, 151 pp., 12 pl., 1936. [Received March, 1937.] Price $2.

This glossary of over 3,000 mycological terms includes the technical terms generally used in college courses on the morphology of the fungi and on mycology. It also defines the special meanings of terms used to describe the Agarics, Boletes, and Polypores. Its usefulness is enhanced by twelve plates of sketches by H. A. C. Jackson.

GRAM (E.) & WEBER (ANNA). **Bekæmpelse af Haveplanternes Sygdomme.** [Control of diseases of horticultural plants.]—Alm. Dansk Gartnerforening (S. L. Møllers Bogtrykkeri, Copenhagen), 184 pp., 86 figs., 1 diag., 1937.

This is the ninth enlarged and revised edition of a handbook, first published in 1910, which contains in a compact and readily intelligible form much useful information on the symptoms, causes, and control of the principal insect pests and diseases of horticultural plants in Denmark. An annotated list of plant protectives is appended.

Zesde International Botanisch Congres, Amsterdam, 2–7 September, 1935. [Sixth International Botanical Congress, Amsterdam, 2–7 September, 1935.] Proceedings. I. Report of Activities.—xvi+450 pp., 2 pl., 11 figs., 1936; II. Abstracts of sectional papers.—xiii+317 pp., Leyden, E. J. Brill, 1935.

Among the papers recorded in the second volume of the proceedings of the sixth International Botanical Congress may be mentioned the following: Langeron and Guerra (p. 165) stated that, in their study of the classification of the anascosporous yeast-like fungi, experiments on nearly 2,000 cultures confirmed the principles established by Mme Stelling-Dekker [*R.A.M.*, xvi, p. 412] and allowed them to separate 17 species belonging to Langeron and Talice's 6 genera [ibid., xi, p. 476] into 6 biological groups according to their ability or inability to ferment sugars. It is concluded that the classification of the anascosporous yeast-like fungi, particularly the Mycotoruleae, is based on morphological and biological characters for the genera and species, respectively.

J. Johnson (p. 193) suggested that the present confusion in the nomenclature of plant viruses could be remedied by using a technical name for each virus consisting of the common name of the host on which the virus was first found followed by the term 'virus' and a number corresponding approximately to the chronological order in which the virus is described on the host in question. Alphabetical letters after the number would indicate different strains and degrees of attenuation.

Further studies by H. M. Quanjer (p. 199) confirmed the validity of the classification of potato viroses proposed in 1931 [ibid., x, p. 746]. Interveinal mosaic, identical with Murphy's simple mosaic, is now placed in section 3, 'acronecrosis'. Mild and intermediate mosaic go in section 4 as 'acropetal necrosis', and are closely related to, if not identical with, Murphy's A virus. Only aucuba mosaic remains in

section 1. The Albion potato shows the net-necrosis (section 2) symptoms of leaf roll. Acronecrosis may be a complex of viruses belonging to section 3. Several viruses produce acropetal necrosis in some varieties; the virus of stipple streak differs from Smith's Y virus, and causes on the Bravo variety symptoms of rugose mosaic. Complex viroses of the crinkle type develop only when a virus in section 3 is combined with one in section 4. Pseudo-net necrosis (section 5) can be transmitted by stem-grafting and leaf inoculation. More than one virus may cause the condition, and produce different symptoms in different varieties. A tuber-transmissible virosis belonging to section 6 (concentric necrosis) has been found.

T. G. Tutin (p. 203) stated that all *Zostera* marina plants examined in British waters were infected with *Ophiobolus halimus* [ibid., xvi, p. 113].

G[erada] Wilbrink (p. 204) listed a number of definitions of immunological terms agreed upon by the phytopathological section of the Netherlands Botanical Society.

J. C. Walker (p. 206) discussed the nature of resistance as indicated by typical examples of morphological resistance, resistance due to substances present in the host and toxic to the fungus, protoplasmic resistance, and heritable, physiologic *Fusarium* resistance.

Săvulescu and Rayss (p. 208) described a method used in estimating the 'total parasitic effect' of an epidemic of *Nigrospora oryzae* on maize [ibid., xiii, p. 762], which may prove of service in other connexions. The product of frequency in the field and intensity on the plant, each expressed on a scale of 0 to 4, is found for as many fields as possible and the total divided by the number of fields, giving a maximum 'index of parasitic effect' of 16. In 8 pure lines each grown in 11 localities the figure ranged from 0·73 for Cincantin maize to 6·9 for Dinte de cal Pietrosani.

Böning (p. 210) discussed the influence of mineral salts on susceptibility [cf. ibid., xv, pp. 275, 420, *et passim*] and points out that not only a relationship exists between phosphorus +, nitrogen —, potassium + (group inducing resistance) and potassium —, nitrogen +, and phosphorus — (susceptibility group), but also between potassium —, phosphorus +, nitrogen —, and nitrogen +, phosphorus —, and potassium +, and the like.

Discussing so-called plant vaccination [ibid., xv, pp. 674, et seq.] D. Carbone (p. 212) pointed out that the available evidence does not support the hypothesis that vaccinated plants owe their resistance to the antimicrobic effect of the vaccines, to root mutilation or radical absorption of poisons [ibid., xv, p. 389] or to increased turgor [ibid., xiv, p. 386]. Some unknown factor does however, participate, the defensive reaction in vaccinated plants being accelerated, as compared with the controls [ibid., xiii, p. 795].

Delia Johnson (p. 221) obtained 41 cultures of bacteria which destroyed the sporidia of *Ustilago zeae*. Inoculations of young maize plants with water suspensions of each of 12 of these combined with water suspensions of the sporidia of the fungus gave only a few small galls in most cases, though inoculations with the sporidia alone gave normal galls. Inoculations of young galls with suspensions of the

bacterial cultures caused them to break down. The same type of bacteria was found in smut balls from other cereals, and faeces of maize-fed cattle, but not in soils except near drainage from manure.

In volume I of the Proceedings [published after vol. II] reports are given of the discussions and lectures, together with the resolutions adopted by the Congress.

By a resolution of the Nomenclature Committee a textual amendment was made in art. B 54 of the International Rules, it being agreed that 'when on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based, and must be attributed to the author who first published it' [e.g. *Alternaria cheiranthi* (Fr.) Bolle is now the correct citation of *Macrosporium cheiranthi* Fr., notwithstanding the fact that Bolle mistakenly described and figured the species under that name: ibid., xiii, p. 595].

The Committee on description and nomenclature of plant viruses appointed by the Fifth International Botanical Congress (1930) was empowered to continue its considerations and establish an acceptable system of virus nomenclature. J. Johnson submitted a list of plant viruses with tentative designations and synonyms, the proposals contained in which received considerable support from virus workers at the Congress.

It was recommended that the term 'physiologic race' be substituted for 'physiologic form' as more appropriate.

The view was adopted that plant quarantine regulations present an international problem to which the attention of the League of Nations should be drawn [ibid., xv, p. 688].

Report of Proceedings, Second International Congress for Microbiology, London, 1936.—579 pp., 1 graph, 1 diag., Harrison & Sons, Ltd., London, 1937.

In this report it is stated that the resolutions of the Nomenclature Committee of the International Society for Microbiology regarding the status of the genus *Bacillus* and its type species *B. subtilis* [*R.A.M.*, xv, p. 80] were passed by the Second Congress, held in London in July and August, 1936. [In view of this decision, the use of the name *Bacillus* for bacterial species not producing endospores is clearly invalid, and consequently it cannot be retained by plant pathologists for non-sporing bacteria motile by means of peritrichiate flagella.]

It was resolved that 'generic homonyms are not permitted in the group Protista' and that 'it is advisable to avoid homonymy amongst Protista on the one hand, plants or animals (Metazoa) on the other'. It was also agreed that 'while specific substantive names derived from names of persons may be written with a capital initial letter, all other specific names are to be written with a small initial letter'.

Among the papers communicated to the Congress the following may be mentioned. S. F. Ashby (p. 44) recorded the survival in culture of two isolations of the sensitive fungus *Phytophthora hibernalis* [ibid., xvi, p. 312] received from California and South Africa in January, 1933. The optimum temperature for this fungus is 15° to 20° C. and the

maximum between 20° to 25°, but the isolations survived the hot, dry summer of that year, oospore germination being obtained in January, 1934.

J. Henderson Smith (p. 78) in opening a discussion on the general characteristics of viruses pointed out that some problems, such as those connected with the nature of viruses, are more easily studied in plants than in animals. Specificity of host range in viruses is exceptional in animals as well as plants. The same virus may produce different effects in different hosts, and similar symptoms are not necessarily due to the same virus. Closer contact between the animal and plant sides of virus research would benefit both.

T. Matsumoto (p. 91) [ibid., xv, p. 403] in serological studies on plant viruses found that the tobacco mosaic virus passes out from the young inoculated leaf usually in two days at 28° C., travelling to the top and root of the plant almost simultaneously, though usually reaching the top earlier. The virus is as concentrated in the xylem as in the cortex, though weakening with age in the former. Less virus is present in the flower buds, upper stems, and sepals than in the bud leaves, basal stems, and petals, while the stamens and pistils contain very little. With bacteriophage strains from *Bacterium solanacearum* the lytic agents stimulate the production of a specific neutralizing anti-body, but cannot produce precipitin. By means of the precipitin test the author was able to differentiate a number of viruses.

R. N. Salaman (p. 106) expressed the view that plant immunity from virus diseases [ibid., xv, p. 676] depends on the existence of non-virulent sub-varieties of the invading virus. For example, there is no evidence of multiple strains of potato virus Y, but a less virulent variety confers immunity against more virulent strains. Natural immunity, in which virus spread is inhibited by necrotic reaction at the point of entry, can sometimes be overcome by inducing rapid growth, foci developing in the fresh shoots becoming necrosed and localized. In naturally immune plants viruses, apparently, cannot lodge in the cells; the juices of such plants show no evidence of antibodies.

J. Ramsbottom (p. 146), in opening a discussion on mycoses in man, animals, and plants, commented on the bewildering, chaotic condition of the taxonomy of medical fungi, and emphasized the necessity of applying the usual mycological technique and recognized terminology for any progress to be made. He stated that many of the fungi recorded as causing medical mycoses are typical saprophytes, while it is possible that most are only facultative parasites.

E. J. Butler (p. 148) stated that the long-continued attempt to find a type medium on which to grow fungi so as to obtain a standardized morphological description for comparative use has failed, and in its place has grown up the conception of the normal high culture providing the best basis for correct classification. The use of this method has resulted in fuller expression of morphological characters and has been the means of considerably reducing the number of genera and species of the dermatophytes, has greatly simplified the confusion prevalent among these fungi, and confirmed Sabouraud's view of their close mutual relationship. The same principles apply to other fungi, e.g., by the use of natural substrata *Acladium castellanii* [ibid., xv, p. 502] can be shown

to be morphologically closely allied to *Sporotrichum schenkii* [ibid., xvi, p. 254], and that 'acladiosis' should be included in the sporotrichoses. The pathogenic fungi of warm-blooded animals require a cultural technique giving a normal high culture growth.

P. H. Gregory (p. 148) emphasized the value of *in situ* cultures in the classification of dermatophytes.

W. Brown (p. 149) in a paper on the 'Nature of resistance to fungus disease in plants' stated that correlations between resistance and the presence of substances toxic or inhibitory to the parasite are probably exceptions to the rule that the resistance of a plant does not depend on extracts obtainable from it. Resistance is commonly based on the ability of the living tissues to break down the offensive mechanism of the parasite. It was found that in a resistant host apparently containing no substances antagonistic to particular fungi or bacteria, when the living tissue was presented in a form non-susceptible to invasion, it was also unaffected by the cell wall-destroying enzyme. It was also possible to modify the living tissue so that it became susceptible to the parasite and the enzyme.

J. F. D. Shrewsbury (p. 151) found that the common thrush fungus, *Candida albicans* [ibid., xvi, p. 382], is lethal to rabbits inoculated intravenously in doses of not under 60,000,000 living fungus cells per c.c. of inoculum. It is incapable of progressive multiplication in, or invasion of, the body tissue, and all attempts at infection through the natural routes were unsuccessful. Sub-lethal doses cause progressive loss of weight; the fungus cells behave only as irritant foreign bodies in the tissues, producing a non-specific cellular reaction, composed of small, round cells with no giant cells, which are restricted to the immediate vicinity of the fungal embolus.

A. Panayotatou (p. 152) in an account of 'Mycoses of man in Alexandria' stated that in Egypt strains of *Monilia* with the biological and chemical reactions of *M. metalondinensis* [*C. albicans*: ibid., xi, p. 373] and *M.* [*C.*] *tropicalis* [ibid., xv, pp. 439, 502] were isolated in pure culture from cases of acute tonsillitis. A *Penicillium* was isolated from the diseased tongue of a child. A strain of *Monilia* resembling *Zeylanica castellanii* but with a white growth and a negative lead reaction was isolated from a case of respiratory mycosis and named *M. alexandrina*. The same fungus was isolated from mycotic urethritis. *C. tropicalis* was isolated from mycotic vaginitis and a *Cryptococcus* from a case of folliculitis.

BAENS (L.) & YENKO (F. M.). **Effect of molds on some Philippine tanning liquors II.**—*Philipp. J. Sci.*, lxi, 4, pp. 417–426, 4 graphs, 1936. (Issued 1937.)

Further tabulated studies on the effects of *Aspergillus niger* and *Penicillium glaucum* and of mixtures of these on the tanning liquors extracted from betel nut (*Areca catechu*) kernels and the bark of *Acacia decurrens*, *Terminalia edulis*, and *Pithecolobium dulce* [*R.A.M.*, xvi, p. 266] showed that in general mould action decreased the tannin content of the extracts. A rise in the P_H value of the extracts resulted in a considerable decrease in tannin content. The lower the acid content of the extract the greater was the mould action. The betel nut and

A. decurrens extracts were susceptible to *Aspergillus niger* but resistant to *P. glaucum*, the reverse obtaining with *T. edulis*. Both moulds caused large loss of tannin in the *P. dulce* extract.

McKinney (H. H.). **Virus mutation and the gene concept.**—*J. Hered.*, xxviii, 2, pp. 51–57, 1 pl., 2 figs., 1937.

From his study of mutation in the virus of tobacco common mosaic [*R.A.M.*, xv, p. 321] the author suggests that the virus and its mutants show the essential elements of inheritance, since they regenerate true to measurable types, the mutants and sub-mutants retain characters of the primary virus, and the sub-mutants those of the strains from which they derive.

It is unnecessary to assume that the virus is a degenerated organism; it may be a stage in progressive development, and may possess a simple metabolism. The primary virus and its mutants are no doubt a series of related compounds functioning as genes. The characters of a given virus may correspond with the properties of a single compound and changes in any of these characters (mutants) may indicate changes in the compound.

Cook (M. T.). **Insect transmission of virus diseases of plants.**—*Sci. Mon., N.Y.*, xliv, 2, pp. 174–177, 1936.

A concise review is given of some of the more important contributions to the knowledge of the transmission of plant viruses by insects, of which over 135 species are now stated to be recognized as vectors. The first allusion to the subject traced is from England, where Smee reported in 1846 that *Aphis vastator* was very abundant on potatoes affected by 'curl' disease, while Woods in 1897 drew attention to the presence of aphids [*A. gossypii*] on material affected by the Bermuda lily disease [yellow flat or rosette] now known to be due to a virus [*R.A.M.*, xiii, p. 165]. Rice dwarf in Japan [ibid., xvi, p. 123] and curly top of sugar beets in the United States [see above, p. 433] appear to be the first diseases for which definite records of insect transmission are available. The more recent references to these and other disorders cited have been noticed from time to time in this *Review*.

Dominik (T.). **Badania nad mykorhizą niektórych obcych drzew iglastych aklimatyzowanych w Polsce.** [Observations on the mycorrhiza of certain foreign coniferous trees acclimatized in Poland.]—*Roczn. Nauk rol.*, xli, 2, pp. 44–46, 1937. [French summary.]

Morphological and anatomical studies showed that the roots of 11 species of imported conifers, which have become acclimatized in Poland, have found in their new surroundings suitable soil fungi, chiefly Basidiomycetes, with which to develop an adequate mycorrhizal system. In some localities, however, the roots examined were devoid of mycorrhiza, but this also applies to strictly native coniferous species, and is attributed to the influence of edaphic and other environmental conditions. Observations indicated that the trees supplied with mycorrhiza thrive better, and are economically more valuable, than those deprived of these formations.

Garbowski (L.). **Wpływ gleby na rozwój mozaiki smugowatej w doświadczeniu z odmianą Ziemniaków Industria Modrowa.** [Influence of soil on the development of streak mosaic in tests with the Potato variety Modrow's Industrie.]—*Roczn. Nauk rol.*, xli, 2, pp. 387–391, 1937. [English summary.]

Details are given of comparative tests in 1935, in which virus-diseased potatoes of the Modrow's Industrie variety of the same origin were grown on a fertile and well-manured soil and in a poor, sandy soil dressed with only 8 kg. potassium nitrate, 12 kg. of a 22 per cent. potassium salt, and 10 kg. superphosphate per 5 ares. The resulting crop was heavily infected with virus diseases, especially with a condition termed by the author 'streak mosaic', characterized by a deformation of the leaf blades, streaks in the vicinity of the veins, brittleness of the stems, and premature yellowing and death of the lower leaves. About $2\frac{1}{2}$ times as many plants on the sandy soil were affected with the disease as on the fertile plots, but the percentage reduction in yield of individual plants due to the disease was approximately the same on the two soils. It is pointed out that topographically and ecologically the environmental conditions were very similar on the two descriptions of experimental plots.

Ruhland (W.) & Michael (G.). **Zur Physiologie des sog. Kartoffelabbaues.** [On the physiology of the so-called Potato degeneration.] —*Ber. Verh. Akad. Wiss. Leipzig*, lxxxviii, 1, pp. 3–10, 1 graph, 1936.

Such physiological disturbances as are liable to occur in the carbon assimilation, respiration, carbohydrate translocation, and diastatic functions of potato tubers are not regarded by the writers as specific indicators of 'degeneration' [*R.A.M.*, xvi, p. 401]. A more uniform and general cause must underlie the heterogeneous and disconnected complex of individual manifestations, and this was shown by studies on the 'degenerating' Erdgold, Wekaragis, Odenwälder Blaue, and Modrow's Industrie varieties to reside in a weakened or pathological condition of the protoplasm, expressed by enhanced susceptibility (abnormal plasmolysis and giving-off of anthocyanin) to the action of unbalanced sodium chloride solutions and to certain narcotics, e.g., 3 c.c. ether per l. air space, the latter inducing post-mortem discolorations (black in the parent tubers, grey to brownish-yellow in the progeny).

Ramshorn's electrometric method (*Planta*, xxii, 1934), involving the measurement of the polar potential difference between the apical and basal tuber pole on living tubers [cf. *R.A.M.*, xvi, p. 336], was used to determine the progressive degrees of degeneration in the progeny of affected tubers. For practical purposes, however, the writers recommend the ether and salt methods, the latter merely consisting in the strewing of large quantities of sodium chloride over the cut tuber surfaces, to which 'degenerate' material reacts by a discoloration of the basal region.

In a brief concluding discussion, the writers state that their observations do not conflict with the virus theory of degeneration, but they are not absolutely convinced of its validity.

SCHULTZ (E. S.), CLARK (C. F.), RALEIGH (W. P.), STEVENSON (F. J.), BONDE (R.), & BEAUMONT (J. H.). **Recent developments in Potato breeding for resistance to virus diseases.**—*Phytopathology*, xxvii, 2, pp. 190–197, 1937.

Further experiments at Presque Isle, Maine, in connexion with the development of potatoes resistant to virus diseases [*R.A.M.*, xiv, p. 464] revealed wide variations in the reaction of varieties and seedlings to these disorders. Some seldom or never contract a given virus by leaf-rubbing in the field but do so in graft tests, while in other cases the disease is readily transmitted by both methods. In the latent mosaic trials several hundred plants of S 41956 failed to contract the disease either by leaf-rubbing or grafting, whereas Katahdin was highly resistant in the field but became infected by grafting. The latter has been completely resistant to mild mosaic [see below, p. 489] in field tests for a number of years, but it is not homozygous for this character as shown by the susceptibility of 9 per cent. of the seedlings in a selfed progeny. The offspring of the No Blight×Katahdin cross gave a ratio of apparently resistant to susceptible of 86 : 14. No definite evidence of resistance to veinbanding mosaic [ibid., xvi, p. 116] was forthcoming, but the severity of the symptoms varied greatly—from intensive streaking and rugosity to mild wrinkling—in the offspring of different crosses. Similar variations were observed in tuber-grafting tests with spindle tuber [see preceding abstract] and leaf roll, the field exposure trials in both of which diseases yielded indeterminate results, though leaving grounds for hope that at any rate tolerance, if not resistance, to these disturbances may be developed.

MADER (E. O.) & MADER (MARY T.). **The composition of tubers of sprayed and unsprayed Potato plants in relation to cooking quality.** —*Amer. Potato J.*, xiv, 2, pp. 56–59, 1937.

The tubers of potato plants sprayed with Bordeaux mixture [chiefly against *Phytophthora infestans*] were found to darken much less on cooking than those from untreated plants, a fact that may be correlated with the lower tyrosine and iron contents of the former (0·0483 and 0·422 per cent., respectively) compared with the latter (0·0715 and 0·667) [cf. *R.A.M.*, xii, p. 531].

TUCKER (J.). **The value of seed Potato certification to the Potato industry.**—*Amer. Potato J.*, xiv, 2, pp. 39–45, 1937.

Some figures are quoted to illustrate the value of seed potato certification to the Canadian potato industry [*R.A.M.*, xii, p. 188; xiv, p. 494]. In 1935 the total acreage certified was 83,537 and the total production 16,551,608 bushels, the corresponding figures for 1920 being 10,674 and 1,294,671, respectively. During the five-year period 1932 to 1936, the average percentages of blackleg [*Erwinia phytophthora*], leaf roll, and mosaic in the 41,496 fields inspected were 0·16, 0·21, and 0·9, respectively, compared with 0·67, 0·34, and 2·39 in 20,537 fields in 1922 to 1926, and with 0·22, 0·13, and 0·76 in 47,855 fields in 1927 to 1931. During the five-year period 1921 to 1925, 32·05 per cent. of the total number of fields examined were rejected, mainly on account of virus

diseases, whereas in 1931 to 1935 the percentage was reduced to 24·19 in spite of higher standards and more than double the acreage. By means of the tuber-unit selection method the yield obtained per acre in commercial fields has been increased from 369·1 bush. in 1928 to 417 in 1934.

GREEVES (T. N.). **The control of blight (Phytophthora infestans) in seed Potatoes by tuber disinfection.**—*Ann. appl. Biol.*, xxiv, 1, pp. 26–32, 1 pl., 1937.

Storage rot in seed potatoes due to late blight (*Phytophthora infestans*) is stated to be frequently severe in the tubers lifted during periods when the fungus is sporulating on the tops. The results of experiments carried out in Belfast showed that the rot may be prevented by disinfecting the tubers immediately after digging, while disinfection two or three days later gave little or no control of the rot. The two methods of disinfection tested, namely, steeping the tubers for 90 minutes in 0·1 per cent. mercuric chloride solution or dipping them for 30 seconds to 1 minute in a 1 per cent. solution of a proprietary organic mercury compound, gave equally satisfactory control, and had no injurious effect on the subsequent sprouting of the tubers. The mercuric chloride steep caused, however, a slight pitting in the form of small brown depressions on the surface of the tubers. There was, further, an indication that the practice of 'greening' the seed tubers by leaving them exposed out of doors in boxes is not likely to give any control of late blight, when digging is followed by wet weather.

GOSS (R. W.). **The Fusarium wilt of Potatoes.**—*Proc. 22nd ann. Meet. Ohio Veg. Grs' Ass.*, pp. 60–66, 1937.

In Nebraska, *Fusarium* wilt of potatoes [*R.A.M.*, xvi, p. 56] may be caused by *F. oxysporum* or *F. solani* var. *eumartii* or by both together, and there is no reliable method of distinguishing the two diseases by tuber symptoms though stem-end rot is not produced by inoculation with the former fungus. For all practical purposes the grower may regard *Fusarium* wilt as one disease.

Three years' tests with infected Bliss Triumph potatoes showed average stands of 66 and 92 per cent. for infected and healthy seed, respectively, the percentages of infection in the field and in the harvested potatoes being 14 and 19 per cent. for infected seed and 3 and 7 per cent. for healthy seed. When the same lot of healthy, treated seed potatoes was sown on 100 different farms 94 per cent. of the fields produced infected tubers, the average amount of infection for all the fields being 4·5 per cent. One field, with 47 per cent. infection, had never before been planted to potatoes, and another, with 30 per cent., was virgin soil. This is regarded as evidence that both fungi may be present in virgin soils, though many soils appear to be free from them.

Experience has shown that heavily infested soil is more dangerous than infected seed; when infection takes place from the soil through the cut surface of the seed piece, the stem is quickly affected and often becomes completely rotted early in the season, the tops rapidly wilting.

Control offers a difficult problem, but incidence can be reduced by planting only healthy seed pieces or small whole seed and avoiding soils

that produced a heavily infected crop in the previous year. The average date of planting in Nebraska is 10 days to 2 weeks later than it was ten years ago, and this delay reduces not only wilt, but also scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium solani*], and early blight [*Alternaria solani*].

Goss (R. W.). **The effect of crop rotations on some soil-borne diseases of the Potato.**—*Proc. 22nd ann. Meet. Ohio Veg. Grs' Ass.*, pp. 77–84, 1937.

Further results obtained on the experiment in progress in western Nebraska since 1912 to determine the effect of irrigated crop rotations on potato diseases [*R.A.M.*, xv, p. 603] showed that from 1932 to 1936 inclusive the highest infection by *Rhizoctonia* [*Corticium solani*], as estimated by the weight of tubers with sclerotia, was 70 per cent., and occurred in the plot planted continuously to potatoes for 25 years. There was a large amount of infection in the two-year rotations with beets (26 per cent.), oats (31 per cent.), or maize (25 per cent.), but a marked decrease occurred in the four-year rotations; no further reduction resulted when the rotation was increased to six years.

The results with *Fusarium* wilt [*F. oxysporum* or *F. solani* var. *eumartii*: see preceding and next abstracts] were somewhat less definite, but the highest infection occurred in the two-year rotation with maize, where it was slightly greater (7·8 per cent.) than in the continuous potato plot (6·5 per cent.). There was a marked reduction in infection in the four- and six-year rotations with lucerne preceding potatoes, and the best results were in the long rotations in this series.

Rotations under four years resulted in considerably more scab [*Actinomyces scabies*: ibid., xvi, p. 273] than longer ones, but continuous cropping of potatoes gave relatively little scab, possibly because the potatoes ceased growth about one month earlier than those in the better rotations and were usually very small. The increased yields and larger tubers resulting from manuring, however, showed it to be economically profitable, even though it greatly increased the percentage of scab.

Goss (R. W.). **A review of the disease problems confronting the Nebraska growers of certified seed Potatoes.**—Reprinted from *Rep. Neb. Potato Impr. Ass., 1936*, 14 pp., [1937].

From 1931 to 1935, the chief virus disease in Nebraska potato fields entered for certification was spindle tuber [*R.A.M.*, xv, p. 821], owing undoubtedly to the number of insect vectors of this disease and their prevalence. At the first inspection each year, during the early stages of growth, incidence ranged from 31·7 to 50 per cent. infected fields, with 0·2 to 0·5 per cent. average infection per field. The next most prevalent virus disease was mild mosaic, but the percentage infection per field was not large. Rugose mosaic, unmottled curly dwarf, and curly dwarf [ibid., xvi, p. 270] were present to a slight extent in a few fields. Blackleg (*Erwinia carotovora*) occurred in the low-lying parts of some fields, but is not a serious problem.

Fusarium wilt (*F. oxysporum* and *F. solani* var. *eumartii*) [see preceding abstracts] usually occurred in 80 to 95 per cent. of the fields,

infection averaging about 3 per cent. of the harvested crop, even after severe roguing and the rejection of badly diseased fields. Tuber infection was lowest in 1934, when drought prevailed, incidence generally being highest in years favourable to production. *Alternaria solani* was not of great importance as a rule but may cause considerable loss in storage, *Rhizoctonia* [*Corticium*] *solani* caused much sprout injury in cool, wet springs, and *Actinomyces scabies* [see preceding abstract] was apparently present in all soils, but was less important in dry than in damp years.

A condition known locally as 'hay wire' and present in Nebraska potato fields for at least fifteen years has recently become increasingly prevalent, 47·4 per cent. of the fields being affected in 1935. The hills emerge late or not at all, and the dormant seed pieces may produce sprout tubers. The affected plants are much dwarfed, with a rosette appearance. The leaflets are generally rugose, erect, stiff, rolled, pointed, yellowish, and often purple at the tips and margins. The petioles and stems may show red or purple swellings at the nodes, and sometimes aerial tubers develop in the leaf axils. Tubers, when formed, are few, and set close to the stem. In some cases, the underground stem may be rotted with a brown flecking in the pith of the stems at the nodes. Plants in the greenhouse also showed a blight of the terminal leaflet extending a short distance down the stem, accompanied by a hollow stem split at the apex.

No pathogenic organism was found in affected tissues. Over 100 tuber plug inoculations gave negative results, but when inarch grafts were made from affected to healthy plants the latter developed haywire symptoms. The disease would appear to be of virus origin, but the very slow spread indicates that probably a comparatively uncommon insect vector is involved.

TULLIS (E. C.). **Fungi isolated from discolored Rice kernels.**—*Tech. Bull. U.S. Dep. Agric.* 540, 11 pp., 4 figs., 1936.

Considerable importance is attached to the fungal discoloration of rice kernels, which is becoming increasingly prevalent in Louisiana, Texas, and Arkansas, especially in early varieties, such as Fortuna, Early Prolific, and Lady Wright. The elimination of the defect gives rise to excessive breakage in milling operations, yet the removal of the blemishes is essential to the good appearance and value of the finished product. Various types of discoloration have been observed, by far the most frequent being the ebony-black to chocolate-brownish stains produced by *Curvularia lunata* [*R.A.M.*, xvi, p. 232] and the light brownish tinge (macroscopically indistinguishable from the foregoing) due to *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xvi, p. 405]. Kernels attacked by *C. lunata* may bear small, dark sclerotia, similar organs being also typical of *Trichoconis caudata* (Ap. & Str.) Clem., the agent of a faint pink to reddish-brown discoloration of the caryopsis. *Monascus purpureus* [ibid., viii, p. 785] produces a red stain or spotting of the kernels and may also be isolated from the glumes. Other fungi isolated on maize meal agar from kernels of 18 varieties after sterilization by hot water (five minutes at 54° C.) or a two-minute dip in 1 in 1,000 mercuric chloride included (in order of frequency) *Phoma* spp., *Alternaria* spp., *Cladosporium herbarum*, *Nigrospora oryzae* [ibid., xv,

pp. 746, 779], *Curvularia maculans*, *Epicoccum neglectum* [ibid., xiii, p. 538], and *Helicoceras oryzae*. The parasites gain ingress through the glumes and attack the kernel before maturity, while the saprophytes may develop at a later stage from spores lodged within the glumes at flowering time, or they may penetrate the glumes of the harvested rice in the shock.

NELSON (R.). **Verticillium wilt of Peppermint.**—Abs. in *Phytopathology*, xxvii, 2, p. 137, 1937.

The initial symptoms of a serious peppermint [*Mentha piperita*] wilt, first observed in Michigan in 1924 but thought to be responsible for the earlier abandonment of large acreages of the crop, include dwarfing and the unilateral development and bronzing of terminal leaves. In July and August the affected plants show typical *Verticillium* symptoms and rapidly succumb, necessitating the premature cutting of diseased fields and involving low yields of oil. English and American peppermints are very susceptible, but some of the spearmints [*M. spicata*] are resistant. The disease is caused by a species of *Verticillium* morphologically resembling *V. dahliae*. Soil moisture exerts a marked influence on the development of the disorder, the destructiveness of which has been enhanced during the last six years by excessive drainage and droughts. Satisfactory commercial control has been effected by the maintenance of a high water table.

BLUMER (S.). **Pilze. Neue oder bemerkenswerte Vorkommnisse und neu unterschiedene schweizerische Arten.** [Fungi. New or noteworthy finds and newly differentiated Swiss species.]—*Ber. schweiz. bot. Ges.*, xlv, pp. 297–311, 1936.

The following are among the records of interest not already noticed from other sources, in this annotated list of new or otherwise noteworthy Swiss fungi. *Phyllactinia suffulta* [*P. corylea*: *R.A.M.*, xiv, p. 680] was collected in October, 1935, on a cultivated pear at Morges [Vaud]. *Acer platanoides* and roses at Berne suffer severe damage from *Verticillium albo-atrum* [ibid., v, p. 469; xii, p. 338; xvi, p. 286].

JØRSTAD (I.). **Notes on some heteroecious rust fungi.**—*Nyt Mag. Naturv.*, lxxvii, pp. 105–119, 1 fig., 2 maps, 1937. [Norwegian summary.]

Chrysomyxa woronini was detected in the spring of 1936 on a spruce near Oslo. The alternate host, *Ledum palustre*, is very rare in south Norway, the nearest locality in which it occurs being 30 km. away, while a distance of some 140 km. separates the infected site near Oslo from a region of continuous distribution of *L. palustre* in south Sweden. The rust produces witches' brooms on *L. palustre* and malformations on the current year's spruce shoots. Liro regards *C. woronini* and *C. ledi* [*R.A.M.*, xii, p. 799] as identical, but the author has shown in his study on Kamchatka Uredinales [ibid., xiii, p. 597] that this view cannot be maintained.

The aecidial stages of the rust 'races' comprised in the collective species *Melampsora epitea* [ibid., xv, p. 175] attacking *Salix* in the mountains are found on species of *Saxifraga*, *Viola*, and probably

Epilobium. The 'race' *M. reticulatae* Blytt, for instance, alternates between *S. aizoides* and *Salix reticulata* [ibid., xi, p. 412], and probably also *S. phylicifolia* and *S. hastata*. Those alternating with *Saxifraga* are united as *M. arctica* and occur at altitudes up to 1,600 m. The aecidial host of *M. alpina* [loc. cit.] on *Salix herbacea* and *S. polaris* is *Saxifraga oppositifolia*. The caeomata occurring on *E. hornemanni* and other *E.* spp. are probably connected with a race of *M. epitea* on *Salix phylicifolia*. *M. lapponum*, the distribution of which is primarily subalpine, passes its aecidial stage on *V. palustris* and *V. epipsila* [*V. suecica*] and rarely forms teleutospores on *S. lapponum*.

CONNERS (I. L.). **Additions to the fungus flora of Anticosti Island and Gaspé Peninsula.**—*Canad. Field Nat.*, li, 1, pp. 6–7, 1937.

The following are among the fungi collected by J. Adams on Anticosti Island and the Gaspé Peninsula, Quebec, during 1935 [cf. *R.A.M.*, xv, p. 259]: *Claviceps purpurea* on *Oryzopis asperifolia*, *Gymnosporangium clavipes* [ibid., xvi, p. 190] on *Amelanchier canadensis*, *G. juniperi* [ibid., xv, p. 609] on *Sorbus* [*Pyrus*] *americana*, and *Cylindrosporium hiemalis* causing a well-defined shot hole disease of *Prunus pennsylvanica*.

ARTHUR (J. C.) & CUMMINS (J. B.). **Philippine rusts in the Clemens collection 1923–1926, II.**—*Philipp. J. Sci.*, lxi, 4, pp. 463–488, 4 pl., 1936. (Issued 1937.)

This final instalment of the authors' annotated list of rusts in the Philippine Islands [*R.A.M.*, xv, p. 827] includes 113 species on hosts belonging to 38 families, of which the following may be mentioned: *Crossopsora fici* n.sp. on *Ficus variegatus*, *Pucciniosira clemensiae* n.sp. (known in the teleutospore stage only) on *Berberis barandana*, *Puccinia periodica* on *Derris polyantha*, and *Uredo derridicola* n.sp. on *Derris* sp. Latin diagnoses are supplied for all new species and an index to the rusts enumerated in this series of papers is appended.

TAI (F. L.). **Note on Chinese fungi. VII.**—*Bull. Chin. bot. Soc.*, ii, 2, pp. 45–66, 5 pl., 1936.

Continuing his enumeration of Chinese fungi [*R.A.M.*, xv, p. 746; xvi, p. 1], the writer presents an annotated list of 55 species of *Cercospora*, including *C. althaeina* on *Althaea rosea* [ibid., xiv, pp. 471, 755]; *C. apii* on celery [ibid., xv, p. 552]; *C. brachypus* on *Parthenocissus tricuspidata*; *C. canescens* [ibid., xvi, p. 344] on cowpea, *Phaseolus aureus*, *P. vulgaris*, *P. mungo* and its var. *radiata*, and *Dolichos lablab*; *C. cannabis* on hemp [ibid., xii, p. 395]; *C. chrysanthemi* on *Chrysanthemum coronarium*; *C. circumscissa* [ibid., ii, p. 535; iv, p. 682; xi, p. 789 and next abstract] on peach; *C. citrullina* on vegetable marrow [ibid., x, p. 771]; *C. cruenta* (as synonyms of which, on the authority of C. Chupp's examination, the author regards *C. phaseolina*, *C. phaseolorum*, *C. vignae* E. & E. [ibid., vi, p. 148], *C. dolichi* [ibid., xiii, pp. 11, 674], *C. vignae* Rac. [ibid., xiii, p. 805], *C. lussoniensis*, *C. raciborskii*, *C. vignae-sinensis*, and *C. neovignae* [loc. cit.]) on cowpea [ibid., xiv, pp. 195, 280] and *P. mungo*; *C. daizu* on soy-bean [ibid., xiii, p. 490]; *C. destructiva* on *Euonymus japonicus*; *C. hydrangeae* on *Hydrangea*

paniculata; *C. kaki* on persimmon; *C. paeoniae* on *Paeonia albiflora* [ibid., xv, p. 99]; *C. personata* (*C. arachidis*) on groundnut [ibid., xv, p. 278; xvi, p. 232]; *C. pueraricola* on *Pueraria thunbergia* [*P. hirsuta*]; *C. sorghi* on sorghum [ibid., xiv, p. 286]; *C. sphaeriaeformis* Cke (*C. ulmi* Syd.) on elm (*Ulmus pumila*); *C. subsessilis* on *Melia azedarach*; *C. vignicola* on cowpea; and *C. vitis* (*C. viticola*) on vine [ibid., xii, p. 395].

KOVACHEVSKY [KOVAČEVSKI] (I. C.). Нови паразитни гжби за България. IV Приносъ. [Parasitic fungi new for Bulgaria. Fourth contribution.]—*Trav. Soc. bulg. Sci. nat.*, xvii, pp. 13–24, 1936. [English summary. Received April, 1937.]

An annotated list is given of 19 plant-parasitic bacteria and fungi, all recorded for the first time from Bulgaria during the last few years, including the following: *Phytomonas* (*Bacterium*) *cumini* on cumin (*Cuminum cyminum*) [*R.A.M.*, xv, p. 681]; *Bact. vesicatorium* [ibid., xvi, p. 419] and *Aplanobacter michiganense* [loc. cit.] on tomatoes; *Mycosphaerella rabiei* on chick pea (*Cicer arietinum*) [ibid., xv, p. 700]; *Entyloma fuscum* on cultivated poppy (*Papaver somniferum*) [ibid., xv, p. 23]; *Phoma lingam* [ibid., xv, p. 335; xvi, p. 438] on cabbage; *Septoria curvata* causing a leaf spot of *Robinia pseud-acacia*; *S. melissae* on *Melissa officinalis* [ibid., viii, p. 790]; *Gloeodes pomigena* and *Leptothyrium pomi* on apple fruits [ibid., xv, p. 745]; *Cryptosporium minimum* on the rose [ibid., xvi, p. 229]; *Fusicladium depressum* var. *petroselini* on parsley [ibid., i, p. 354]; *Cercospora circumscissa* [see preceding abstract] on almond nursery seedlings; *C. roesleri* on the vine [ibid., xv, p. 200]; *Isariopsis griseola* on French beans (*Phaseolus vulgaris*) [ibid., xiv, p. 734]; and *Macrophomina phaseoli* on French beans, *Vicia sativa*, sunflower (*Helianthus annuus*), and groundnut; by its sclerotia the last-named fungus belongs to Haigh's group C [ibid., ix, p. 686].

RAILLO (Mme A. I.). Систематика и методика определения видов рода **Fusarium.** [Taxonomy of the genus *Fusarium* and a method for the determination of the species belonging to it.]—*Acta Inst. Bot. Acad. Sci. U.R.S.S.*, Sér. II (*Pl. Cryptogamae*), *1936*, 3, pp. 803–857, 6 pl., 5 figs., 1936. [English summary.]

In this paper the author gives a detailed description of the standardized method suggested by her for the systematic study of the fungi belonging to the genus *Fusarium* [*R.A.M.*, xv, p. 684], as well as instructions for the preparation of the standard culture media (potato agar and acidified potato agar) which she considers as best adapted to maintain a typical development of the organisms. She further recommends that the measurement of macroconidia be made at regular intervals of 15 days from the inception of the cultures to ensure that none is over 15 days old, since her observations showed that these organs are most characteristic of the given species on the 15th day of growth.

In the second part dichotomous keys are given for the determination of the sections and species of the genus, based on the work of Wollenweber, though the recent joint monograph of this author and Reinking [ibid., xiv, p. 708] was received by the writer too late to be taken into consideration in this paper.

Andrus (C. F.) & Harter (L. L.). **Organization of the unwalled ascus in two species of Ceratostomella.**—*J. agric. Res.*, liv, 1, pp. 19–46, 7 figs., 1937.

This is a detailed and fully illustrated account of the authors' studies of the origin and development of the ascus in *Ceratostomella fimbriata* [*R.A.M.*, xv, p. 734] from sweet potato and *C. moniliformis* isolated from timber (on which it does not appear to be an active agent of decay or blue stain), as representatives of Ascomycetes with asci of the so-called deliquescent type. Among other cytological details, considerable stress is laid on the fact that in the two species investigated the asci possess no external wall at any stage of their development, the vesiculate condition in *C. moniliformis* being made evident by the presence of a cleavage space surrounding the spore-producing region, while in *C. fimbriata* a definite endogenous wall, of the nature of a plasma membrane, equivalent to the surface layer of cytoplasm such as occurs on any essentially naked or plasmodial mass, frequently encloses the vesicle. Data are presented which tend to show that this membrane is continuous with, or derived from, the membrane of the fusion nucleus. Deliquescence in these species, therefore, involves a disorganization of the peripheral layer of cytoplasm but does not appear to involve any process of wall dissolution.

Gwynne-Vaughan (Helen C. I.) & Broadhead (Q. E.). **Contributions to the study of Ceratostomella fimbriata.**—*Ann. Bot., Lond.*, l, 200, pp. 747–758, 2 pl., 15 figs., 1936.

As a result of their cytological studies on a culture of *Ceratostomella fimbriata* [see preceding abstract], which was sent to them by Andrus, the authors state, in describing the origin and development of the perithecium, that the multinucleate cells, the cells of the ascogenous hyphae, and the asci all possess the usual delicate cell walls, staining convincingly with erythrosin; no naked cells were seen by them, but sometimes a large vacuole in the cytoplasm of the ascus produces the illusion that the ascus nuclei are enclosed within it. The ascospores are of the form usually described as bowler hat-shaped.

Tubbs (F. R.). **On the growth and carbohydrate supply of the Tea plant after pruning.**—*J. Pomol.*, xiv, 4, pp. 317–346, 1 pl., 2 graphs, 1937.

In this physiological study of the reaction of the tea plant to three types of pruning, viz., 'clean' (pruned bush left almost leafless), 'lung' (some branches not pruned until a few days before 'tipping'), and 'cut across' (only diseased branches removed below the pruning-level) at elevations of 4,600, 1,500, and 200 ft. in Ceylon the following results are recorded in relation to die-back or *Diplodia* disease, ascribed by Petch to *Botryodiplodia theobromae* [*R.A.M.*, viii, p. 677; xv, p. 747]. It was found that at 200 ft. above sea-level, the mean number of dead bushes per plot after tipping in 1932 was 1·3, 11·2, and 4·5 for the three methods, respectively. The amount of die-back present varied from very little to complete death, the weights of the dead material for the three plots being, respectively, 21·7, 57·7, and 37·8 lb. One month after pruning, the average number of leaves per bush for each plot was,

respectively, 226·2, 9·5, and 61·3. The evidence indicated that die-back and the death of whole bushes after pruning are due to similar causes, and supported Gadd's view [ibid., viii, p. 69] that the disease is of physiological origin.

The author points out that tea shoots probably produce only half the carbohydrates necessary for their growth and that if die-back is associated with carbohydrate deficiency the production and removal of flush shortly before pruning should increase the disease. When 30 bushes were pruned after weekly yield records had been made for eight months, and the die-back per bush weighed, the results indicated that increased production of shoots in the month preceding pruning increased the amount of die-back.

In another test, early pruning by the 'clean' method gave most die-back, but the number of branches (3 or 6) left unpruned had no effect; with late pruning the three methods gave no difference.

The effects of 'lung' as compared with 'clean' pruning varied considerably at the three elevations, and as die-back occurred only at 200 ft. a survey was made of the carbohydrate reserves present in the roots at the different elevations. This showed that the percentage of total carbohydrates increased with increased elevation, the linear regression $y = 11{\cdot}17 + 0{\cdot}20\,x$ (y = percentage of carbohydrate, x = height in feet above sea-level) accounting for 77 per cent. of the variance in carbohydrate content. If die-back incidence is governed by the carbohydrate supply available after pruning, then this relationship explains the occurrence of die-back at low elevations only. Young seedlings also showed less starch at low than high altitudes.

TUBBS (F. R.). **Investigations on the planting, pruning, and plucking of the Tea bush.**—*Bull. Tea Res. Inst. Ceylon*, 15, 59 pp., [? 1937].

In chapter VI of this bulletin the writer discusses the relationship between pruning and the die-back of tea bushes ascribed by Petch to *Botryodiplodia theobromae* [see preceding abstract], and concludes that at elevations above 3,000 ft. sufficient carbohydrate reserves are present in the bushes to permit satisfactory recovery after pruning, but that at lower altitudes a certain amount of foliage must be left on the plants.

BALD (J. G.). **The use of numbers of infections for comparing the concentration of plant virus suspensions. I. Dilution experiments with purified suspensions.**—*Ann. appl. Biol.*, xxiv, 1, pp. 33–55, 4 graphs, 1937.

This is the first of a series of papers dealing with the principles involved in the estimation of the concentration of plant virus suspensions used in experimental inoculation work, and with the investigation in as much detail as possible of the various techniques adopted by various workers, a brief review of which is given. In a discussion of certain of the conditions on which the equation formulated by Youden, Beale, and Guthrie [*R.A.M.*, xv, p. 781] depends, the author shows that the exponent *-ax* in it may be conveniently replaced by the function *-m* which represents the ratio of virus units entering and causing infection to the total number of entry points, leaves, or whole plants, according to which of these latter units is used as a standard for judging infections.

The new equation then takes the form $y = N(1-e^{-m})$, in which the other symbols retain their former signification. The symbol m represents a mean value, and should be directly proportional to the concentration of the virus in the inoculum, provided there is no change of the virus unit with a change of concentration; it is by definition the product of two components, namely, p representing the probability of a single virus particle entering to cause infection, which is very small, and n representing the number of possibly infective particles applied, which is large. For the particular case of dilution experiments, the function m may then be expanded to pn_1x, in which n_1 is the value of n for an undiluted sample of inoculum, and x is a fractional value representing the concentration of the undiluted sample in the diluted inoculum. If the equation is based on correct premisses, then lack of agreement between the values obtained in dilution experiments and those calculated from the equation can only be due to variations in the values of N, p, and n_1 through ineffective control of the experimental environment, and ultimate agreement may be attained by a continuous improvement in the experimental methods.

The experiments described in this paper were made in the attempt to refine the technique until agreement was attained, since preliminary work had failed to show agreement between the experimental and calculated values. Seven successive dilutions of carefully purified samples of the viruses of the tobacco mosaic group, namely, tomato streak, yellow tobacco (aucuba) mosaic, and ordinary tobacco mosaic, and of potato virus X were inoculated into *Nicotiana glutinosa*, the inocula of the last-named virus being also tested on White Burley tobacco. The data obtained from the experiments, local lesions being reckoned as infection units, showed a fair degree of agreement with the values calculated from the equations fitted to them, as also did those obtained in the tests in which y was taken as the number of leaves infected. Two types of irregularities (distortions), however, were noticed in the dilution series, suggesting that they may have been mainly due to an effect of the impurities in the inoculum on the values of one or more of the terms N, p, and n_1; the real causes of these distortions cannot be definitely established without supplementary evidence. There were also indications that it is apparently unwise to assume that constant values of N will be obtained in lesion-dilution experiments except under the most carefully controlled conditions, and that the values for N and the other terms of the equation will necessarily be independent. In some of the cases discussed there was a suggestion at least that N may be independent of pn_1.

Government of India. Department of Education, Health and Lands. Notification. Agriculture.—4 pp., 1936.

By notification No. F.–320/35–A, dated 20 July 1936, superseding No. 580–240 [*R.A.M.*, ii, p. 239], the restrictions on the import of plants into India are modified as follows: No plant shall be imported by air. No citrus plants or cuttings may be imported unless accompanied by a certificate stating that they are free from mal secco (*Deuterophoma tracheiphila*) or that the disease is not present in the country of origin.

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BALD (J. G.). **The use of numbers of infections for comparing the concentration of plant virus suspensions. II. Distortion of the dilution series.**—*Ann. appl. Biol.*, xxiv, 1, pp. 56–76, 2 graphs, 1937.

Continuing his studies in this series [*R.A.M.*, xvi, p. 495, and next abstract], with particular reference to the distortions in the dilution experiments, the author distinguishes between the types of infection-dilution series given by unpurified samples of viruses of the tobacco mosaic group and by viruses less resistant to loss of virulence, namely, potato virus X, tobacco ring spot, tobacco necrosis, cucumber mosaic, and tomato spotted wilt. It was shown that in the series for the tobacco mosaic group, when the inocula were diluted with distilled water or buffered near the neutral point, distortion existed more in the concentrated than in the dilute end of the series, and that the form of the series was changed when the hydrogen-ion concentration was acid; the addition of healthy plant juices to the inocula tended to produce two opposing effects on the production of local lesions, namely, a stimulation and a depression. While the causes of these tendencies are difficult to decide, it is suggested that the depressing effect may be assumed to be due partly to the destruction of possible entry points, and partly to the adsorption of virus particles by impurities. In the series for the less resistant viruses, the distortions (low values) occurred at high dilutions. The addition of concentrations of the order of 0·01 and 0·1 *M* of neutral potassium phosphate-phthalate buffer to unpurified suspensions of X virus depressed the numbers of lesions produced, while when added to purified samples of this virus, the buffer produced high values for lesions at a concentration of about 0·00005 *M*, low values between 0·0001 and 0·001 *M*, a maximum between 0·001 and 0·01 *M*, and a decline at higher concentrations. It is tentatively suggested, to explain the effects of salts on the production of lesions by virus X, that the virus particles tend to aggregate in groups not readily dissociating on dilution, and that the electrolyte content affects the degree of aggregation. The time and probability of the appearance of symptoms after inoculation depends on the massiveness of inoculation, the likelihood of positive infection being high when a single large aggregate or a number of aggregates enter at one point, and low when entry is effected by single small aggregates.

Bald (J. G.). **The use of numbers of infections for comparing the concentration of plant virus suspensions. III. The effect of carbon on the production of lesions by viruses of the Tobacco mosaic group.**—*Ann. appl. Biol.*, xxiv, 1, pp. 77–86, 1 graph, 1937.

In this, the third paper of this series [see preceding abstract], the author describes experiments in which the spreading power was compared of distilled water, suspensions of plant juice, suspensions of finely divided carbon (lamp black), and of a commercial spreader. The results showed that the contact angle of the plant juice and commercial spreader suspensions was lower than that of water and of carbon suspensions, and that when rubbed on the surface of *Nicotiana glutinosa* leaves and on paraffin wax surfaces the plant juice and the spreader gave good contact compared with the distilled water; when treated in the same way, the carbon particles in the carbon suspensions adhered to the surfaces, carrying with them a film of water. The effect of carbon and of plant juice, observed by the author and certain other workers, in raising the number of infections when present in plant virus inocula, may thus be explained by the better contact of the inoculum with the leaf surface. When added in uniform amounts to a number of dilutions of purified suspensions of viruses of tomato streak, aucuba mosaic, and ordinary tobacco mosaic, lamp black caused an equal rise in the number of lesions produced on *N. glutinosa* leaves, but when the lamp black was diluted in the same ratio as the viruses, the effect was decreased. The rise given by carbon was shown to be largely a function of the leaf tissues, probably of the nature of the leaf surface, since differences were observed between plants and between leaves of the same plant.

Loring (H. S.) & Stanley (W. M.). **Isolation of crystalline Tobacco mosaic virus protein from Tomato plants.**—*J. biol. Chem.*, cxvii, 2, pp. 733–754, 1 fig., 1937.

This is an expanded, fully tabulated account of the writers' experiments in the isolation of a crystalline tobacco mosaic virus protein [see next abstracts] from diseased Bonny Best tomato plants, a preliminary note on which has already been published [*R.A.M.*, xv, p. 404]. The most active material was yielded by young, rapidly growing greenhouse plants subjected to a procedure involving a minimum amount of treatment with celite. The proteins from both hosts were shown to possess the same infectivities, serological properties, isoelectric points, sedimentation constants, and almost the same solubilities. Repeated fractionation of the virus protein with celite at P_H 4·5 and 8 results in its gradual inactivation, but it retains its solubility and may still be crystallized. It was shown by other fractionation experiments, in which up to 81 per cent. of the original sample was lost in the course of 15 re-crystallizations, that the remaining crystals were equally virulent with those constituting the original material. A comparison of the relative infectivities of the juices of diseased tobacco and tomato plants on a total protein basis indicates, in agreement with the percentage yields of crystalline virus protein isolated, that the tobacco mosaic virus reaches a higher concentration in tobacco than in tomato plants.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. IX. Correlation of virus activity and protein on centrifugation of protein from solution under various conditions.**—*J. biol. Chem.*, cxvii, 2, pp. 755–770, 1937.

Ultra-centrifugation of solutions of mixtures of ordinary tobacco and aucuba mosaic virus proteins and tobacco proteins, egg albumin, trypsin, and pepsin, respectively, resulted in the sedimentation of the high molecular weight virus protein in the form of a crystalline mass at the bottom of the tube and in the concentration of the virus activity, gauged by the number of lesions produced by inoculation into half-leaves of *Phaseolus vulgaris* and *Nicotiana glutinosa*, in this protein mass [*R.A.M.*, xvi, p. 417]. The supernatant liquids containing the low molecular weight proteins were found to possess practically no virus activity, which is evidently not due, therefore, to an agent separable from the high molecular weight protein and transferable to others.

When the virus proteins were centrifuged at their isoelectric points, or when negatively or positively charged virus protein ions were centrifuged from solution on an angle centrifuge so that the upper portion of the supernatant liquids contained 5 to 15 per cent. of the original protein, the virus activity of different portions of the centrifuged preparations was proportional to the amount of high molecular weight protein present. Ultra-centrifugation of over 99·9 per cent. of the high molecular weight virus protein from solution yielded a supernatant liquid with an activity approximately proportional to the protein remaining in solution. These data are considered to indicate that the virus and the protein are identical, the activity of the former being a specific property of the high molecular weight protein.

LORING (H. S.) & STANLEY (W. M.). **Comparative properties of virus proteins from a single-lesion strain and from ordinary Tobacco-mosaic virus.**—*Phytopathology*, xxvii, 2, pp. 134–135, 1937.

Tobacco plants infected with virus derived from ordinary mosaic by several passages in *Nicotiana glutinosa* by means of single necrotic lesions develop typical mosaic symptoms. The treatment of such plants by the procedure used for the isolation of virus protein [see preceding abstracts] produces a crystalline preparation differing in certain minor particulars from that yielded by the ordinary tobacco mosaic virus. The crystals of the former, for instance, are somewhat longer and narrower than those of the latter; the single-lesion virus protein, moreover, has a higher sedimentation constant, is less soluble, and more homogeneous (judged by solubility determinations and ultra-centrifugal analysis) than the ordinary tobacco mosaic virus.

JOHNSON (J.). **Factors relating to the control of ordinary Tobacco mosaic.**—*J. agric. Res.*, liv, 4, pp. 239–273, 7 figs., 1937.

After referring to a previous communication on the inactivation and survival of the ordinary tobacco mosaic virus (tobacco virus 1) in soil [*R.A.M.*, xv, p. 532], the author gives a full account of experiments (local lesion tests on a tobacco hybrid (*Nicotiana tabacum* × *N. glutinosa*) especially suitable for such work) on the survival of the virus in dead

host tissues outside the soil, in an attempt to explain the development of the disease in the field in relation to cultural practices and weather conditions [see next abstract]. The tabulated results showed that the virus in refuse from harvested tobacco, and also in field refuse, may be largely inactivated when exposed to weathering and decay for five or six months, inactivation being greatly promoted by desiccation of the refuse at a relatively early stage of decay. Inside the host roots buried in the field the virus was shown to survive in high concentration up to the next planting season; when closely associated with soil, the virus survived as long as two years in the absence of freezing and desiccation. Certain brands of cigar and cigarette tobacco were found to carry fairly high concentrations of the virus, but other commercial tobacco forms carried little or none at all.

The investigations indicated further that while little, if any, infection occurs through the host roots, the stems and leaves may be infected from several sources, and most commonly from the soil; although direct infection from this source may rarely exceed 25 per cent., subsequent spread from plant to plant by various cultural practices accounts for the high percentages of mosaic sometimes observed. Evidence was also obtained that rain and wind storms play a part in the dissemination of the disease in the field.

In a discussion of the application of these findings to the control of mosaic, it is pointed out that practically the problem may be reduced to the determination and reduction of the important potential sources of infection; once, however, considerable primary infection has become established, further spread is often unavoidable under practical field conditions.

LEHMAN (S. G.). **Contaminated soil in relation to the epiphytology of Tobacco mosaic.**—Abs. in *Phytopathology*, xxvii, 2, p. 133, 1937.

In continuation of previous experiments to determine the relation of contaminated soil to the epiphytology of tobacco mosaic [in North Carolina: *R.A.M.*, xiii, p. 729 and preceding abstract], four plots were laid out in a field of Norfolk sandy loam. Two were in tobacco in 1935, nearly 100 per cent. of the plants being affected by mosaic; the entire diseased crop was disked into the soil at the end of the growing season. The other two plots were in maize in 1935. Healthy plants were set on all the plots in 1936. Up to topping time, no mosaic developed on the tobacco following maize and only 0·65 per cent. on that preceded by the mosaic crop. Some additional mosaic developed after topping, probably due in the main to accidental handling of infected material during the operations. These results confirm those of earlier investigations as to the negligible extent of the damage caused by the direct passage of mosaic into tobacco plants even from heavily contaminated soil.

CLAYTON (E. E.). **Spraying as a method of control for mildew (Peronospora tabacina) and wildfire (Bacterium tabacum) in Tobacco plant beds.**—Abs. in *Phytopathology*, xxvii, 2, p. 124, 1937.

Tobacco [downy] mildew (*Peronospora tabacina*) [*R.A.M.*, xvi, p. 284 and next abstract] is stated to have been reduced to negligible propor-

tions, and wildfire (*Bacterium tabacum*) [ibid., xvi, p. 68] almost completely controlled in five years' (1932 to 1936) experiments in the United States by a combination of early weekly Bordeaux sprays followed at a later stage by semi-weekly applications of a copper oxide-cottonseed oil mixture.

Henderson (R. G.). **Histological studies of infection and sporulation of Peronospora tabacina in Tobacco seedlings.**—Abs. in *Phytopathology*, xxvii, 2, p. 131, 1937.

On greenhouse tobacco seedlings the conidia of *Peronospora tabacina* [see preceding abstract] germinate on the leaf surface and directly penetrate the epidermis. A slight enlargement, possibly representing an incipient appressorium, is formed at the end of the germ-tube coming into contact with the leaf surface. A small hyphal strand is pushed through the upper wall of the epidermal cell, within which an enlarged hypha develops and usually sends out haustoria into the surrounding cytoplasm and adjacent cells. On reaching the inner cell wall the enlarged hypha or one of its branches, forms another enlargement and traverses the cell wall by means of a small hyphal strand and arrives at the intercellular spaces of the mesophyll. Similarly, the germ-tube may penetrate a leaf-hair cell and the hypha pass from cell to cell until the mesophyll is reached. Conidiophores may arise from the stomata on either leaf surface, but are restricted to the lower one under average moisture conditions. Conidiophores bearing conidia have been observed entirely embedded in the spongy parenchyma.

Imle (E. P.) & Samson (R. W.). **Studies on a ring-spot type of virus of Tomato.**—Abs. in *Phytopathology*, xxvii, 2, p. 132, 1937.

Tomatoes in many parts of Indiana are affected by a disease characterized by intricate patterns of brown, necrotic rings and lines on the young foliage, broad, sunken, necrotic streaks on the petioles and stems of young shoots, necrosis of shoot terminals, and often corky, brown, necrotic rings on green and ripe fruits. The symptoms suggest the name 'tomato ring spot'. Infected plants may recover from the disease while retaining the virus in an active form. The severity of the disorder was intensified by high temperatures. Mechanical transmission of the ring spot virus was readily effected from tomato to Jimson weed [*Datura stramonium*] by means of carborundum abrasive, but transmission back to tomato was practicable only by grafting, or by passage from *D. stramonium* to tobacco and thence to tomato. The thermal death point of the virus was found to lie between 56° and 58° C.; it was inactivated by 21 to 27 hours' ageing *in vitro* at room temperature, and rendered completely non-infectious by dilutions of 1 in 500. The ring spot virus was communicated to, and recovered from, 14 Solanaceae and one member of the Amaranthaceae.

Azevedo (N.). **Observaçoes sobre uma doença de virus em Tomateiro.** [Observations on a virus disease of the Tomato.]—*Rodriguésia*, ii, 6, pp. 209–212, 7 pl., 1936. [Received May, 1937.]

A very brief account is given of a diseased condition, believed to be due to a virus, which was observed in the 'Grande liso' tomato variety

in an experimental field at Itatiaya, Brazil. The main symptoms are a rolling inwards of the mature leaves, and a crinkling and rosette-like deformation followed by wilting and rotting of the apical growth. The main veins of the rolled-up leaves often show a violet discoloration which also almost invariably occurs in the secondary veins of crinkled leaves, being most pronounced at the margins and gradually fading off towards the main veins. Fruits on diseased plants develop various types of spots, among which those in the form of concentric rings, closely resembling the American ring spot, are the most common; other spots may be irregular in shape and more or less covered with crusts of necrotic tissue, which render the fruit unmarketable; occasionally the spot appears as an equatorial zone around the tomato, slightly depressed, and covered with crusts. The disease differs from spotted wilt in that the leaves never exhibit ring spots nor the bronzing typical of spotted wilt, streak, and crinkle.

GARDNER (M. W.), TOMPKINS (C. M.), & THOMAS (H. R.). **Factors affecting the prevalence of the spotted wilt virus.**—Abs. in *Phytopathology*, xxvii, 2, p. 129, 1937.

Localities in the United States characterized by mild winters, no summer rainfall, and the continuous presence of living hosts of the spotted wilt virus [*R.A.M.*, xv, p. 182; xvi, p. 367] appear to constitute endemic infection foci whence considerable spread of the disease by thrips may take place during the spring and summer. The virus is least abundant just after the winter rains, possibly owing to a reduction in the insect population. It may be harboured by certain common winter weeds, such as mallow [*Malva*] and chickweed [*Stellaria media*], in addition to various ornamentals and winter crops. The occurrence of spotted wilt in regions at a distance from infection foci is frequently traceable to the introduction of the virus with imported transplants. In regions where the disease is prevalent, a lower percentage of infection occurs in celery, celeriac, spinach, peas, endive, and chicory than in tomato, pepper [*Capsicum annuum*], and lettuce [ibid., xv, p. 737], while onions, rhubarb, beets (fodder and sugar), chard [*Beta vulgaris* var. *cicla*], globe artichoke [*Cynara scolymus*], carrots, parsley, beans (*Phaseolus*), crucifers, and cucurbits are apparently immune, and potatoes, though susceptible [ibid., xv, p. 538], seem to escape attack.

FOSTER (A. C.). **Environmental factors influencing the development of blossom-end rot of Tomatoes.**—Abs. in *Phytopathology*, xxvii, 2, pp. 128–129, 1937.

It was observed in the course of a four-year study on the relation of environmental factors to blossom-end rot of tomatoes [*R.A.M.*, xvi, p. 421] that plants grown continuously in soil with a low moisture content are resistant to the disease, presumably on account of their hardened state. On the other hand, plants grown under optimum soil-moisture conditions uniformly develop blossom-end rot after exposure to drought. Increasing amounts of nitrogen are apparently conducive to the occurrence of blossom-end rot when other conditions favour the disorder, the incidence of which is markedly reduced, on the contrary, by augmented applications of phosphate. When other conditions are

favourable temperature is not a factor in the development of blossom-end rot, which often occurs at mean temperatures of 65°, 70°, or 75° F. There is stated to be no connexion, moreover, between the disorder and the water requirements of the plants.

Bavendamm (W.). **Vierjahresplan und Holzschutz.** [The four-year plan and wood protection.]—*Angew. Bot.*, xix, 1, pp. 1–18, 1937.

In connexion with the German four-year plan the writer outlines the principal measures calculated to render the country self-supporting in respect of timber production. An important step in this direction consists in prolonging the durability of the raw product by rational methods of impregnation, making use of such indigenous materials as fluorides, arsenates, nitrated phenols, and zinc salts in preference to mercury compounds (of foreign origin) or coal-tar oil (utilizable for locomotion and heating). Some interesting statistics are cited in support of this campaign.

Bavendamm (W.). **Aus der Praxis der mykologischen Holzschutzmittelprüfung. II. Mitteilung. Arsenhaltige Mittel.** [On the practical aspect of the mycological testing of timber preservatives. Note II. Arsenic-containing preparations.]—*Angew. Bot.*, xix, 1, pp. 18–42, 1937.

Continuing his practical observations on the technique of mycological tests of timber preservatives [*R.A.M.*, xv, p. 546], the writer discusses some recent experimental work by himself and others which strongly emphasizes the importance of selecting for such trials fungi relatively insensitive to the particular poison to be used. Failure to observe this precaution is considered to be largely responsible for the misleading statements constantly appearing with regard to the efficacy of certain inadequately tested preparations. To cite a recent instance, the results set forth by O. Günther in his thesis: Der Holzschutz und seine Bedeutung für die deutsche Volkswirtschaft., Berlin, 1936 (Verlag W. Knapp, Halle a. S.), are to some extent invalidated by his use of the highly sensitive *Coniophora cerebella* [*C. puteana*] for experiments with arsenic-containing preparations, including thanalith U [*R.A.M.*, xvi, p. 430]. Günther's favourable opinion of the last-named cannot be altogether confirmed by the writer on the basis of his tests of basilit U A (stated to be closely similar in composition to thanalith U) with the extremely insensitive *Lenzites abietina* [ibid., xvi, p. 292]. A marked tendency to leaching-out is a disadvantage of basilit U A which should be remedied before placing this material among the preservatives of recognized efficacy.

Kürbis (P.). **Mykologische Untersuchungen über den Wurzelbereich der Esche (Fraxinus excelsior L.).** [Mycological investigations on the rhizosphere of the Ash (*Fraxinus excelsior* L.).]—*Flora, Jena, N.F.*, xxxi, 2, pp. 129–175, 11 figs., 6 graphs, 1937.

The examination, during the winter of 1933–4, the autumn of 1934, and the summer of 1935 at the Hann. Münden Silvicultural Institute, of the rhizosphere of ash (*Fraxinus excelsior*) specimens from various parts of Germany revealed no mycorrhizoid elements in the true sense,

but a number of 'companion fungi' [*R.A.M.*, xv, p. 520] were isolated in pure culture on biomalt agar and other media, of which the most constant were *Cylindrocarpon radicicola* [ibid., xv, p. 605] and fungus imperfectus I (*Rhizoctonia sylvestris*) [ibid., xiv, p. 187]; in addition to these may be mentioned *C. didymum*, *Trichoderma koningi* [ibid., xv, p. 257], fungus imperfectus II (probably *Cladosporium herbarum* [ibid., xiv, p. 275]), *Citromyces sanguifluus* Sopp (most likely identical with *Penicillium roseo-purpureum*), and several other species of *P.* and *Verticillium*. Some of these fungi were shown to be powerful acid-formers, e.g., *P. expansum*, which in five days reduced the P_H value of the medium from 5·6 to 3·2, while others, such as *Cylindrocarpon radicicola* and *R. sylvestris*, gradually induce a slight uniform decline in the P_H value; *T. koningi* and *V. glaucum* [ibid., ix, p. 133] caused indiscriminate rises and falls in the hydrogen-ion concentration. *C. radicicola, Citromyces sanguifluus*, and *R. sylvestris* reacted to small doses (0·1 per cent.) of calcium carbonate by peculiarities in mycelial growth, accompanied in the case of the last-named by a marked increase in dry weight. *Cylindrocarpon radicicola* and *R. sylvestris* develop best on media with an almost neutral reaction which they gradually shift towards the acid side, and it may be assumed that their behaviour in nature is similar.

Ash seedlings in sterile sand did not thrive and eventually died, while those in non-sterile sand, or in sterilized sand inoculated with fungi or watered with root extract, made considerably better growth. Ash seedlings planted in close contact with *Sambucus nigra* showed a conspicuous retardation of growth, whereas interplanting with *Ranunculus ficaria* somewhat stimulated development, but no exact correlation could be determined between the progress of the seedlings and the composition of the rhizosphere mycoflora.

JOHNSON (EUNICE M.). **Distribution of Cephalosporium and Verticillium on Elm in Massachusetts.**—*Plant Dis. Reptr.*, xxi, 3, pp. 58–59, 1 map, 1937. [Mimeographed.]

Some 75 per cent. of the 5,000 specimens examined at the Shade Tree Laboratory in 1935–6 were collected from elm trees, and the opportunity was taken to compile a statistical survey of the relative prevalence in Massachusetts of the *Cephalosporium* and *Verticillium* wilts [*R.A.M.*, xv, pp. 130, 485; xvi, p. 142]. The former fungus was found to be much the more widespread, occurring in 337 of the samples inspected, while the latter was present in 142.

WALTER (J. M.) & MAY (C.). **Pathogenicity of a brown cultural variant of Ceratostomella ulmi.**—Abs. in *Phytopathology*, xxvii, 2, pp. 142–143, 1937.

Ceratostomella ulmi was shown by a study of monospore (conidium and ascospore) isolations to comprise a wide range of cultural races, some of which retained their distinctive characters through several transfers while others continued sectoring. A brown variant isolated from diseased elms in the United States [*R.A.M.*, xvi, p. 350 and next abstract] and England differs strikingly from the characteristic type. It was inoculated with successful results into American elms in the

greenhouse and English elms growing naturally, and was recovered in all cases from the diseased material.

BANFIELD (W. M.). **Distribution of spores of wilt-inducing fungi throughout the vascular system of the Elm by the sap stream.**—Abs. in *Phytopathology*, xxvii, 2, pp. 121–122, 1937.

Spore suspensions of fungi causing elm wilt, including *Ceratostomella ulmi* [see preceding abstract], were injected into the bases or tops of 4- to 8-in. elms from early spring to late autumn [? in Wisconsin]. The spore suspension was poured into a funnel-shaped pan cemented around the stem and all actively conducting vessels severed below the surface of the liquid. Three hours to three weeks after injection the distribution limits of the spores were determined by identification of the fungi in cultures made from centrifuged sap displaced from various levels in the tree or from the subsequently discoloured wood, a procedure involving the cementing of metal collars round the upper ends of stem sectors, filling the collars with sterile water, and collecting the liquid that dripped from the stem bases. The maximum fungal distribution in the trees after three days in April was 2 in. above and 2 ft. below the points of injection. After three hours in June spores were recovered 30 ft. above the sites of insertion and after two days in October 24 ft. below them. *C. ulmi* spores were removed from the sap stream of naturally diseased trees in May, July, and September.

SLEETH (B.) & ROTH (E. R.). **Basal decay in Oak-stands of sprout origin.**—Abs. in *Phytopathology*, xxvii, 2, pp. 139–140, 1937.

Stereum gausapatum [see next abstract] was found to be the agent of a basal decay of sprouted oaks [*R.A.M.*, xvi, p. 4] in 75 per cent. of the specimens examined in the eastern and central United States, *Quercus velutina* showing the highest and *Q. montana* the lowest incidence of infection. Over 90 per cent. of the decay was traced directly to the parent stump, the remainder originating largely from the removal of a companion sprout or from a dead standing sprout.

DAVIDSON (R. W.), CAMPBELL (W. A.), & BLAISDELL (DOROTHY J.). **Cultural identification as a necessary supplement to tree decay studies.**—Abs. in *Phytopathology*, xxvii, 2, p. 127, 1937.

Among the more important of the relatively little known fungi ascertained to be responsible for extensive decay of trees during the last three years in the United States are *Stereum gausapatum* [see preceding abstract], *Polyporus compactus*, *Poria andersonii*, and *Corticium lividum* from oaks, *Polyporus glomeratus* from maple [*Acer* spp.], and *Stereum murrayi* from birch. The following characters are used in the identification of the organisms from diseased material: growth rate at different temperatures, colour and texture of mycelial mat, fruiting in culture, odour, oxidase reaction, and microscopic appearance. Cultural comparison is essential for the correct determination of these fungi, many of which cause similar types of decay; few of the heart-rotting group produce sporophores, and several different organisms may be present in a single tree.

Škorić (V.). **Poria obliqua (Pers.) Bres. Prinos poznavanju biologije i patološkog djelovanja gljive.** [*Poria obliqua* (Pers.) Bres. A contribution to the biology and pathology of the fungus.]—Reprinted from *Ann. Exp. for., Zagreb, 1937*, 31 pp., 4 pl., 5 figs., 3 diags., 1937. [German summary.]

A morphological, cultural, and taxonomic account is given of *Poria obliqua* [*R.A.M.*, xvi, p. 139], which is stated to be fairly frequent in Jugo-Slavia on the bitter oak [*Quercus cerris*], the evergreen oak [*Q. ilex*], and the beech, in association with a white or yellowish heart rot resulting in the formation of cavities of varying size inside the trunks; the rotting wood is separated from the healthy sap wood by a dark brown zone, 5 to 10 mm. thick, and is traversed by transverse and longitudinal dark brown lines. While the pathogenicity of *P. obliqua* was not tested experimentally, observations indicated that the heart rot invariably developed round a dead branch or twig, and was further assisted by the activity of secondary organisms.

Cole (J. R.). **Bunch disease of Pecans.**—Abs. in *Phytopathology*, xxvii, 2, p. 125, 1937.

Bunch disease of pecans (*Hicoria* [*Carya*] *pecan*), characterized by branch and shoot brooming, early spring leafage of affected branches, chlorotic, thin, broad, wavy, and flexible leaves, and in the later stages, dying-back of the branches, was first observed in 1932 in the Red River Valley of Louisiana, and is now known to be present also in Mississippi, Oklahoma, and Texas. The disease was transmitted by grafting affected Schley scions on healthy stocks of the same variety. The Schley and Mahan varieties are very susceptible to bunch, while Stuart is highly resistant.

Cummins (J. E.). **'Included sapwood' in Karri (E[ucalyptus] diversicolor).**—*J. Coun. sci. industr. Res. Aust.*, x, 1, pp. 29–32, 1937.

Examination of a number of samples of karri (*E[ucalyptus] diversicolor*) containing so-called 'included sapwood' (i.e., sapwood included by and in the true wood), showed that this sapwood generally contained dead sap-staining fungi. There was no significant difference between the strength of material containing included sapwood and that of the normal true wood. Normal included sapwood is not regarded as a defect in structural material for use under conditions not conducive to decay, but for certain special purposes, such as wood pipe stock, its presence is undesirable. It appears to be always associated with borer development in the living tree.

Kaufert (F. H.). **The biology of Pleurotus corticatus Fries.**—*Tech. Bull. Minn. agric. Exp. Sta.* 114, 35 pp., 10 figs., 1 graph, 1936. [Received June, 1937.]

A fully tabulated account is given of the writer's cultural studies on five collections of *Pleurotus corticatus* from fire-scarred trees (three from *Liquidambar styraciflua* and two from *Quercus nuttallii*) in the Mississippi Delta; the affected trees showed decayed areas extending up to 10 or 12 ft. up the centre of the bole. The fungus grew best at 27° C.

on malt agar, forming conidia on coremia and also singly on both the dicaryotic and haploid mycelia. Fertile sporophores were formed in culture on a mixture of barley, wheat, and basswood (*Tilia americana*) sawdust. Mating experiments showed the fungus to be heterothallic and tetrapolar. Basswood sawdust was more rapidly decayed by the dicaryotic than by the haploid mycelia in tests lasting 90 to 150 days, after which time, however, the difference begins to disappear; after 90 days the loss in weight caused by the haploid cultures ranged from 3 to 5 per cent. compared with 9 to 17 per cent. for the dicaryotic. The optimum moisture content for decay is between 110 and 130 per cent., rather higher than that of most wood-rotting fungi, while at 150 to 170 per cent. the rate of decay fell sharply. Coremia and conidia are formed in and on basswood blocks, suggesting that the fungus may be disseminated by termites, ants, or other insects in nature.

LIESE (J.). **Die Douglasienrassen und ihre Anfälligkeit gegenüber der Douglasiennadelschütte (Rhabdocline pseudotsugae).** [Douglas Fir types and their susceptibility to Douglas Fir leaf fall (*Rhabdocline pseudotsugae*).]—*Mitt. dtsch. dendrol. Ges.*, xlviii, (*Jb.*), pp. 259–263, 2 pl., 1 diag., 1936.

Details are given of the reaction to needle fall (*Rhabdocline pseudotsugae* [*R.A.M.*, xvi, p. 289] in two districts of Germany of Douglas firs of the three main groups (mountain, transition, and coast) of American origin, the two first roughly corresponding to the blue and grey (*caesia* and *glauca*) types and the last-named to the green (*viridis*). The reputed immunity of the coastal types from *R. pseudotsugae* has not been maintained under experimental conditions, but the damage suffered by trees of this group is negligible in comparison with the injury caused by the disease to the grey forms (the blue are very seldom encountered in German forests), and stringent efforts should be made by nurserymen and silviculturists to exclude any commerce in seeds of the susceptible varieties.

ROHDE (T.). **Erscheinungsformen und Erkennung der Schweizer Douglasienschütte.** [Manifestation forms and recognition of the Swiss needle cast of Douglas Firs.]—*Silva*, xxv, 9–10, pp. 69–77, 10 figs., 1 graph, 1937.

After briefly summarizing the information hitherto available on the needle cast of Douglas firs [*Pseudotsuga taxifolia*] caused by *Adelopus* [*gäumanni*: *R.A.M.*, xvi, p. 356], the writer gives a full account of his supplementary studies on various phases of the disease in Germany.

Like the needle fall of the same host (*Rhabdocline*) [*pseudotsugae*: see preceding abstract], the *Adelopus* disease falls into several more or less distinct stages, but whereas the former fungus attacks first the youngest and then the older needles, the latter pursues a diametrically opposite course, starting on the oldest material available and gradually proceeding to the current year's shoots. In view of the great importance of this phase of the highly complex *Adelopus* disease from the practical standpoint, the writer attempts to formulate the correlations between the incidence of needle cast and the different years of attack, and in this connexion attention is drawn to a number of varying pathological types

arising from the irregular distribution of needles and bare places on the branches. A common phenomenon in diseased trees is the development from the so-called 'sleeping eyes' (dormant buds) of 'water shoots', due to an access of light to the crown from the gaps in the needles. Most of the 'water shoots' observed were one or two years old, but one was four years old, indicating the occurrence of an epidemic in 1931–2.

A detailed description is given of the gradual modifications in the colour of affected needles, accompanying the disease, none of which, however, radically alters the basic green tint until the brown of incipient necrosis becomes apparent. The diseased material presents a variety of shades of yellow, brown, grey, and white superimposed on the green, while rust-coloured spots are also conspicuous at a certain stage. The underside of the needle remains almost or quite free from discoloration.

Viable perithecia may be found at any time of year on all needles, even on fallen and extensively decayed material, but the percentage of ascospore germination declines with age. Apparently the fungus occupies the needles for several consecutive years and annually forms new fruit bodies which remain viable long after reaching maturity.

Transverse sections through fallen needles reveal a conspicuous, fairly coarse inter- and intracellular mycelium distinct from that of *A. gäumanni*, 4 μ in diameter, and not uncommonly showing branching of the hyphal tips. Hyphae of this type were detected in the current season's needles in the late summer and in much greater profusion in one-year-old needles in May. Pure cultures of needle fragments dating from 1936, 1935, and 1934 yielded, respectively, 15, 22, and 26 per cent. *Adelopus* and 4, 6, and 2 per cent. of the undetermined 'alien' mycelium, while 14, 4, and 5 per cent., respectively, were sterile.

LANGNER (W.). **Der Lärchenkrebs.** [Larch canker.]—*Forstarchiv, 1937*, 3, pp. 38–43, 3 figs., 1937.

This is an abbreviated account mainly concerned with the practical silvicultural aspects of the writer's studies on larch canker in relation to *Dasyscypha willkommii* [*R.A.M.*, xvi, p. 220] and environmental factors, the complete version of which has been noticed from another source [ibid., xv, p. 693].

FINDLAY (W. P. K.). **Dry rot investigations in an experimental house.** —*Dep. sci. indus. Res. For. Prod. Res. Rec.* (*Mycol. Ser.* 1) 14, 14 pp., 5 pl., 5 figs., 1937.

Observations since 1931 in the experimentally constructed house at Princes Risborough [cf. *R.A.M.*, xv, p. 186] showed that in the room made with five types of solid flooring inoculated with *Merulius lacrymans* a certain amount of moisture penetrated even the best mixed concrete. The fungus mainly responsible for the decay of badly constructed solid floors is *Coniophora cerebella* [*C. puteana*]. *M. lacrymans* grew actively for a time after its introduction, but conditions apparently became too moist for it, and *C. puteana* became the chief agent of decay.

A continuous damp course of completely waterproof material (e.g., bitumen) must be provided between the concrete raft and the boards. The type of floor in which the boards are nailed directly to battens embedded in the concrete is thoroughly bad. The boards may be nailed

either to a layer of breeze concrete, or to breeze or impregnated wooden fixing-blocks let into the concrete, covered with a layer of bitumen at least $\frac{1}{8}$ in. thick, not less than 10 lb. per sq. yd. being used. The underside of the floor boards should be treated by brush application of a wood preservative if they have not been impregnated.

In the second experimental room, which has a badly constructed, hollow floor inoculated with *M. lacrymans*, fungal growth was determined by weather conditions. Most of the decay during the experiment was due to *M. lacrymans*, which was introduced, but in places rot developed from natural infections of *C. puteana*. *Thuja plicata* boards showed no rot after 33 months, but boards of *Tsuga heterophylla* were attacked in places, mainly by *C. puteana*.

The data obtained demonstrate that if a floor is well constructed and properly ventilated so that the moisture content of the wood remains under 20 per cent., dry rot fungi will not develop even if the most virulent infection is introduced.

GILBERT (W. W.) & POPENOE (C. H.). **Diseases and insects of garden vegetables.**—*Fmrs' Bull. U.S. Dep. Agric.* 1371, 57 pp., 66 figs., 1937.

This is a revision (with the participation of D. J. Caffrey in the place of the late C. H. Popenoe) of an earlier bulletin of the same series and title dealing in popular terms with a number of well-known vegetable diseases and their control in the United States [*R.A.M.*, iii, p. 495].

HAENSELER (C. M.) & MOYER (T. R.). **Effect of calcium cyanamide on the soil microflora with special reference to certain plant parasites.**—*Soil Sci.*, xliii, 2, pp. 133–150, 1 pl., 1937.

Calcium cyanamide (containing 61·5 per cent. $CaCN_2$) applied to sassafras loam soils at the New Jersey Agricultural Experiment Station in amounts up to 10,000 lb. per acre induced striking modifications in the population of fungi, bacteria, and actinomycetes as determined by the plating method. A greater decrease in fungal numbers occurred in soils with reactions near the neutral point than in those of more acid composition.

Both calcium cyanamide and hydrated lime gave effective control of club root of rape (*Plasmodiophora brassicae*) [*R.A.M.*, xvi, p. 222], the former being more active in soils with relatively high P_H values. In pot tests, 200 lb. calcium cyanamide per acre gave fair control of the disease on a soil with an original P_H of 6·4, whereas only a slight reduction in its incidence followed the application of 800 lb. to a soil with an initial reaction of P_H 4·6. In field trials over a three-year period, plots receiving a total of 7,500 lb. lime and 1,800 lb. calcium cyanamide produced very superior crops to those given either of the two treatments singly. In very acid soils the quantity of calcium cyanamide necessary to ensure control proved toxic to the crop immediately following. On heavily infested field plots, liberal treatments with calcium cyanamide and hydrated lime permitted vigorous development of fibrous roots, with the result that even diseased plants were not seriously affected, whereas on adjacent untreated plots, club root was very severe.

Calcium cyanamide, thoroughly incorporated in the soil at rates of

1,000 to 2,000 lb. per acre greatly reduced seed decay and damping-off (*Rhizoctonia* and *Pythium*) [ibid., xiii, p. 497] of cucumber planted immediately after treatment. Used at the rate of 5 to 50 lb. per acre of 24 in. rows and applied in close proximity to the seed just before planting also gave satisfactory control of the damping-off fungi, but under these conditions there was a very narrow margin of safety in respect of seed injury.

A substantial reduction in the incidence of pea root rot (*Aphanomyces euteiches*) [ibid., xii, pp. 413, 609; xvi, p. 234] was effected by the application of calcium cyanamide to outside soil frames at rates of 1,000 to 1,500 lb. per acre, but no beneficial action was exerted by the compound at 1,000 and 2,000 lb. per acre in field trials, nor was it of any value against beet scab (*Actinomyces scabies*).

Coons (G. H.), Kotila (J. E.), & Stewart (D.). **Savoy, a virus disease of Beet transmitted by Piesma cinerea.**—Abs. in *Phytopathology*, xxvii, 2, p. 125, 1937.

Sugar and garden beets in Michigan, Ohio, Minnesota, Nebraska, South Dakota, Colorado, and Wyoming have been observed to show up to 5 per cent. infection by a disease involving stunting, downward curling, and 'savoying' of the leaves, especially the innermost, veinlet clearing followed by thickening, giving a netted aspect to the dorsal leaf surface, and in the final stages discoloration and phloem necrosis of the roots, simulating curly top [*R.A.M.*, xvi, p. 387], from which, however, as well as from the German crinkle [ibid., xv, p. 549], the present disorder is quite distinct. 'Savoy' has been transmitted by adults of *Piesma cinerea* (both viruliferous and non-viruliferous individuals of which are found), but not by means of juice, nor by *Eutettix tenellus*. The virus overwinters in diseased plants and in the insect vector; its incubation period in the sugar beet ranges from three to four weeks. Possibly the disturbance reported from Indiana by Arthur and Golden (1892) and the 'leaf curl' noted in Michigan in 1901 may represent early records of the trouble under observation, the economic significance of which is not expected to be great.

Larmer (F. G.). **Keeping quality of Sugar Beets as influenced by growth and nutritional factors.**—*J. agric. Res.*, liv, 3, pp. 185–198, 1 fig., 1937.

The experiments reported in this paper were carried out in 1932 and 1933 at two centres in Utah, following observations indicating that immature beetroots grown in nutrient cultures deficient in phosphorus were rendered extremely susceptible to invasion by *Phoma betae* which, in association with certain other organisms, is responsible for the decay of the sugar beets in storage [*R.A.M.*, xv, p. 764]. The importance of the loss in sucrose due to such decay is well illustrated by the fact that a large sugar-manufacturing company in the west of the United States estimates the shrinkage in yield in a single season at a value of over $5,000,000, basing itself on the difference of the sucrose percentages established before the storing of the beets and at the moment when they were actually sliced at the factories. While admittedly a portion of this

reduction in sucrose is due to the respiration of the beets in storage, a large part of it is caused by the activity of the rotting organisms.

The fields selected for the tests were known to be deficient in available phosphates, and were divided into three plots, one of which was supplied with a phosphate fertilizer, the second received a complete fertilizer, and the third was left untreated as control. The tabulated results of 75 days' storage experiments in 1933 (in which root decay was most pronounced) showed that while 17·48 per cent. by weight, of the root tissues of beets from the untreated plot was destroyed by the rot organisms, the beets from the phosphate and the complete fertilizer plots showed only 4·23 and 6·18 per cent. decay, respectively. There was also an indication that the phosphate fertilizer reduced the loss in sucrose reserves due to respiration. A further series of tests showed that adequate moisture during the growing season improved the keeping quality of the crop, as well as applications of farmyard manure, presumably chiefly because of its content of available phosphate, its indirect action in making soil phosphate available, and its effect on soil moisture.

These findings were fully corroborated by the results of experiments, which showed that, when artificially inoculated with *P. betae*, roots grown in the presence of an adequate supply of phosphorus developed significantly less decay than the roots from the unfertilized plots.

BURGEVIN [H.] & FOËX (E.). **La maladie du coeur de la Betterave en France.** [Beetroot heart rot in France.]—*C.R. Acad. Agric. Fr.*, xxiii, 6, pp. 195–197, 1937.

In consequence of the damp summer of 1936, heart rot of beets in France did not generally assume such a serious character as in the two preceding years [*R.A.M.*, xiv, p. 282]; the disease was adequately combated where necessary by the application of boric acid to the soil at the rate of 6 to 8 (Loir-et-Cher) or 10 (Mayenne) kg. per hect.

G. Bertrand followed up these observations (pp. 197–199) by some remarks on the constant association of a fungal pathogen [? *Phoma betae*] with beets suffering from heart rot, denoting a connexion between an adequate supply of nutrients (boron in this particular case) and ability to withstand disease.

MEYER-HERMANN (K.). **Bor—das Heilmittel der Herz- und Trockenfäule der Rübe.** [Boron—the cure for heart and dry rot of the Beet.]—*Dtsch. landw. Pr.*, lxiv, 7, p. 75, 1937.

The writer recapitulates his recommendations, based on extensive and protracted field experiments in Germany, for the control of heart and dry rot of beet by the application to the soil of 3½ to 5 kg. borax powder per ¼ hect. [*R.A.M.*, xv, p. 189; xvi, p. 149], which has frequently resulted in increased yields of 1,250 to 3,500 kg. per ¼ hect. (equivalent to a profit of over M. 100 for an outlay of only M. 1·20 to 1·50). The new mixed boron-superphosphate fertilizer obviates the need for the admixture of 15 to 25 kg. potash salt, sand, or superphosphate with the borax powder (3½ to 5 kg.), and should be applied at the rate of 75 to 100 kg. per ¼ hect.

CHAMBERLAIN (E. E.). **Pea mosaic. Its symptoms, economic significance, and preventive treatment.**—*N.Z. J. Agric.*, liv, 3, pp. 129–138, 9 figs., 1937.

Apart from information already noted from another source [*R.A.M.*, xvi, p. 294] the following items may be mentioned from this paper. A test carried out in New Zealand in 1935–6 showed that garden peas with a small percentage of mosaic suffered a reduction of yield, as compared with the healthy controls, of 47·7 per cent. The disease is thought to overwinter on red clover [*Trifolium pratense*] and is spread to other susceptible hosts by aphids in the spring and summer. Field and glasshouse experiments indicated that the Lord Chancellor and Little Marvel varieties are immune from or highly resistant to the disease; for purposes of control the use of these varieties and the growing of other susceptible crops as far removed as possible from areas of infected red clover are recommended.

BRETT (C. C.), DILLON WESTON (W. A. R.), & BOOER (J. R.). **Seed disinfection. III. Experiments on the germination of Peas. Seed protection by the use of disinfectant dusts containing mercury.**—*J. agric. Sci.*, xxvii, 1, pp. 53–66, 1 pl., 1937.

A fully tabulated account is given of field and greenhouse experiments, in which various lots of pea seeds were disinfected with seven different organic mercury dusts (three containing each 1, 2, and 3 per cent. mercury as methyl mercury chloride plus 0·5, 1, and 1·5 per cent. mercury as mercuric iodide, respectively; three containing each 1, 2, and 3 per cent. mercury as methyl mercury phosphate; and one containing 1·7 per cent. mercury as phenol mercury acetate). The results obtained are interpreted as indicating that seed disinfection with a suitable dust may give increased stands and higher yields in marketable pods when the peas are sown earlier than in March, owing to its controlling effect on the soil-inhabiting and seed-borne organisms (chiefly *Fusarium* spp. and *Ascochyta pisi*) [*R.A.M.*, xvi, p. 438]; it is, however, of doubtful value for later sowings, since the ratio of pea seed germination in the field to germination in the laboratory tends to increase as the date of sowing advances, reaching 60 to 65 per cent. for sowings in March and April.

CASALE (L.). **Nuovi rimedi contro la Peronospora della Vite.** [New remedies against Vine *Peronospora*.]—*Ric. sci. Progr. tec. Econ. naz.*, Ser. II, ii, 11–12, pp. 604–609, 1936.

As a result of laboratory and field experiments, the author recommends the following mixture in the control of vine *Peronospora* [*Plasmopara viticola*]: 200 gm. copper sulphate, 50 gm. citric acid, 5 c.c. of a concentrated solution of ferric chloride per 100 l. water, with sufficient sodium hydrate to induce a neutral reaction. The mixture is stated to be comparable in efficacy with Bordeaux mixture but requiring only $\frac{1}{10}$th the amount of copper. [An account of Casale's work is also given by J. Baudin in *Progr. agric. vitic.*, cvii, 21, pp. 494–495, 1937.]

SCHAD (C.). **Les stations d'avertissements agricoles et la lutte contre le mildiou de la Vigne.** [Agricultural forecasting stations and the control of Vine mildew.]—*Ann. Épiphyt.*, N.S., ii, 3, pp. 283–331, 8 graphs, 3 maps, 1936.

In this account of vine mildew (*Plasmopara viticola*) and the development of measures for its control in France, the author discusses in detail the spray warning systems in operation and the factors on which they are based.

In all of the three chief stations, at Montpellier, Bordeaux, and Clermont-Ferrand, the methods used are fundamentally identical. Branas's method [*R.A.M.*, xiv, p. 420], used at Montpellier, is based on the stage of growth reached by the vine and the stage of development reached by the fungus. The primary invasion is determined by observation of the germination of the oospores, and the incubation period is constant, being 9 days for the primary and 7 days for secondary infection. The forecasting of invasions during the summer is made according to the number and state of the infection spots, humidity, duration of rain, and temperature before, during, and after rain.

According to the method devised by Cazeaux-Cazalet and Capus [ibid., x, p. 581], used at Bordeaux, the earliness and intensity of infection is determined by the rainfall from November to April, the secondary invasions being dependent upon the prevalence of spores and the amount of rain. Forecasting is rendered difficult by the variable incubation period in south-western France. When a rainy period is suspected and the vines have 3 or 5 new unsprayed leaves, treatment should be applied. This method enables the date and intensity of an outbreak to be foretold long in advance.

The method used at Clermont-Ferrand is a combination of these two. The dates on which treatment is to be applied are determined by the critical periods of vine growth and the stage of development reached by the fungus when a rainy period is expected.

Müller's incubation calendar method [ibid., xiii, p. 678] requires great care on the part of the grower, who is not generally in a position to make the necessary observations. Moreover, the incubation curve does not strictly apply under French conditions and can only be used in conjunction with other methods, especially where the incubation period varies. The oil spot method used in the Italian province of Treviso [ibid., xvi, p. 86] is regarded as unreliable.

Details are given of the spray warnings issued from the three stations in 1935.

ZWEIGELT (F.). **Das Peronosporajahr 1936 und die französischen Direktträger.** [The *Peronospora* year 1936 and the French non-grafted hybrids.]—Reprinted from *Weinland, 1936*, 11, 2 pp., 1936.

Details are given of the reaction to the *Peronospora* [*Plasmopara viticola*] epidemic of 1936 at Klosterneuburg, Austria, of a number of French non-grafted vine hybrids. On the whole, the results were very disappointing, the majority of the selections, even those heretofore regarded as resistant, succumbing to the disease, while most of those remaining healthy are undesirable on other grounds. An exception was

constituted by three Kühlmann selections (Bon noir, Fin noir, and Directeur Grosjean).

SMALL (T.). **Report of the Mycologist.**—*Rapp. aux États de Jersey, 1936*, pp. 30–50, 1937.

The following items, *inter alia*, are included in this report [*R.A.M.*, xv, p. 555, and below, p. 555]. In 1936 potato blight (*P*[*hytophthora*] *infestans*) did not become serious or widely prevalent in Jersey until after 26th June, when a large crop of tubers had formed, and cutting or scorching the haulms would have prevented heavy loss. Many growers, however, failed to take this precaution. Scorching of unsprayed crops in an advanced stage of infection reduced the amount of blight but did not prevent considerable loss. Spraing [ibid., xvi, p. 399] and dry rot (*Fusarium coeruleum*) [ibid., xvi, p. 272] were found affecting imported seed potatoes.

Outdoor tomatoes were seriously affected by stem rot (*Didymella lycopersici*) [ibid., xv, p. 690]. Inoculations of wounded and unwounded tomatoes with a spore suspension of the fungus from a diseased tomato gave positive results, while seed from diseased fruit gave *D. lycopersici* in pure culture. Sterilization of such seed in mercuric chloride 1 in 3,000 for 5 minutes, followed by washing in water, killed the fungus in many instances, and did not reduce germination. Inoculation tests demonstrated that all the aerial parts of tomato plants are susceptible even when unwounded. Inoculations of stems at soil-level almost invariably failed to produce infection, and attack at this region was frequently found to be due to the fungus growing back into the stem from the lower leaves. Suggestions for control include the use of seed from healthy fruit only, sterilization of the propagating soil, disinfection of old canes in 2 or 5 per cent. formaldehyde for 20 minutes, followed by covering for two days, removal of infected leaves before the main stem becomes infected, single planting in fields usually severely attacked, and paring off young infections of the stem, the wounds afterwards being painted with Bordeaux paste.

BEAUMONT (A.) & STANILAND (L. N.). **Thirteenth Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1936.**—35 pp., 1937.

In this report, which is on the same lines as those for previous years [cf. *R.A.M.*, xv, p. 555], it is stated that in forecasting outbreaks of potato blight [*Phytophthora infestans*] results as good as those given by the five rules previously used were obtained by using two only, viz., (1) minimum temperature 50° F. or over, (2) relative humidity not under 75 per cent. for at least two days. This simplification is to be adopted for future use.

Of the chief commercial tulip varieties grown in south-western England Bartigon, William Copeland, and William Pitt are very susceptible to fire [ibid., xv, p. 508], Avis Kennicott, Carrara, Farncombe Sanders, Princess Elizabeth, Sieraad van Flora, and Zwanenburg fairly susceptible, Clara Butt, Inglescombe Yellow, Moonlight, and Mrs. Moon slightly so, and Baronne de la Tocnaye fairly resistant.

These varieties all belong to the Darwin and Cottage groups. The Mrs. Kerrell and Sultan varieties are fairly resistant.

In notes on fungal diseases observed during the year it is stated that red core (*Phytophthora* sp.) [allied to *P. cinnamomi*: ibid., xv, p. 450] did severe damage to Western Queen and Madame Lefebre strawberries on two farms in the Tamar valley; the identification was confirmed by Mrs. Alcock. Narcissus fire (*Botrytis polyblastis*) [ibid., xiv, pp. 366, 637] occurred in Scilly in April and was exceptionally severe in Cornwall in May. The Pinkie and Sierra Snow snapdragon [*Antirrhinum majus*] varieties at Seale-Hayne showed only 25 and 6 per cent. rust [*Puccinia antirrhini*: ibid., xvi, p. 387], respectively, as against 70 and 90 per cent., respectively, for Melrose and Orange King; Glowing Sunset was unaffected. Marigold smut (*Entyloma calendulae*) [ibid., xvi, p. 493] was prevalent near Penzance. Lupins were affected by leaf spot (*Ceratophorum setosum*) [ibid., xv, p. 775] and mallows (*Lavatera trimestris*) suffered severely from the attacks of *Colletotrichum malvarum* [ibid., vi, p. 462]. *Solanum crispum* was attacked by potato blight [*P. infestans*], a new record for the fungus, *Peronospora grisea* was found on *Veronica* in Scilly, and *Pyracantha* scab (*Fusicladium* [*pirinum* var.] *pyracanthae*) [ibid., xv, p. 230] was noted at Braunton.

Galloway (L. D.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst., New Delhi, 1935–36*, pp. 105–111, 1937.

After referring to the removal of the Imperial Agricultural Research Institute from Pusa to New Delhi the author records the following items of interest, *inter alia*, in this report [cf. *R.A.M.*, xvi, p. 231]. Morphological studies and cross-inoculation experiments indicated that the species of *Colletotrichum* causing a leaf disease of maize in the former locality was identical with *C. graminicola* [ibid., xv, p. 795] which occurs on sorghum. *C. curvatum*, recently reported for the first time in India [ibid., xv, p. 703] on sunn-hemp [*Crotalaria juncea*], is extremely virulent, a spore suspension sprayed on young seedlings producing 100 per cent. mortality; seed treatment gave some control, and considerable protection against infection was afforded by spraying, though this did not arrest the disease.

Asparagus was affected by *Phoma asparagi*, a new record for India [ibid., xvi, p. 13]. The grape rot previously reported as due to a *Coniella* [ibid., xvi, p. 232] was apparently caused by *C. diplodiella* (Speg.) Petr. & Syd. Hemp seedlings were attacked by *Pythium aphanidermatum*. A smut due to *Urocystis sorosporioides* Koernicke was found on *Delphinium* from Simla. *Corticium rolfsii* was stimulated to form its perfect stage by culture in onion-peptone broth.

In the second part of this report (pp. 112–122, by B. L. Chona) it is stated that the thermal death point of Saretha sugar-cane mosaic virus was found to be a little over 50° C., but heating to this temperature did not appreciably reduce the infective power of M. 16 and Co. 313 sugar-cane mosaic virus; further heating at 60° inactivated the latter, but did not completely inactivate the former. The thermal death point of Co. 213 and Red Mauritius mosaic viruses was found to lie between 40° and 45° and 40° and 50°, respectively. Clear brown L 3 filtrate of mosaic juice was non-infective. With both Co. 213 and Saretha mosaic

leaf juice the infective power appeared to fall rapidly when the juices were diluted to 1 in 10 or more. Maize and sorghum inoculated with Co. 213 mosaic juice readily developed infection, with marked mosaic symptoms.

SHEPHERD (E. F. S.). **Botanical and Mycological Division.**—*Rep. Dep. Agric. Mauritius, 1935*, pp. 23–26, 1936.

The following items, *inter alia*, occur in this report [cf. *R.A.M.*, xv, p. 203]. From January until April, 1935, the BH 10/12 sugar-cane variety was somewhat severely affected by smut (*Ustilago scitaminea*) [ibid., xv, p. 607; xvi, p. 232] on several low-lying estates in Mauritius, the high temperatures experienced early in the year possibly having favoured infection. Some crop loss was experienced, especially in the third and fourth ratoons. In November, a moderately heavy outbreak of eye spot disease (*Helminthosporium ocellum*) [ibid., xv, p. 781] occurred in fields of 11 months-old, virgin BH 10/12 cane on one estate.

Tobacco mosaic [ibid., xvi, p. 412] was again present on two estates in the Black River district, but a more systematic roguing late in the year resulted in spread being checked. Inoculation tests demonstrated that mosaic of *Solanum nigrum*, a common weed locally, is transmissible to tobacco. The author considers that the severe mottling seen on the new tobacco disease associated with leafy outgrowths observed in September, 1935 [ibid., xv, p. 610], may possibly indicate that the condition is a combination of mosaic and Storey's leaf curl, but the identity of the disease has not yet been determined. Black shank (*Phytophthora parasitica*) [*nicotianae*: ibid., xvi, pp. 412, 413] caused losses on many estates; some strains of Amarello are showing more resistance than the original one. Granville, wilt (*Bacterium solanacearum*) [loc. cit.] was noted in many localities.

Needle inoculations with bacteria isolated from a heart rot of the white palm *Dictyosperma album* gave positive results on young plants of the same host and on maize.

Report of the Waite Research Institute, Glen Osmond, South Australia, 1933–1936.—182 pp., 27 figs., 15 graphs, 1937.

In the section of this report dealing with manganese deficiency it is stated that the output of mixed fertilizer (sold in bags containing 28 lb. of manganese sulphate—now marketed at £[Australian]15. 10. per ton—and 159 lb. of superphosphate) reached 481 tons in South Australia in 1936, or enough for 8,000 to 10,000 acres. From 1931 to 1935 the yield of barley at Corny Point in fields to which no manganese sulphate was applied averaged 16 bush. 21 lb. per acre, as against 23 bush. 49 lb., 26 bush. 45 lb., and 27 bush. 44 lb. for dressings of 14, 28, and 42 lb. of manganese sulphate per acre, respectively [*R.A.M.*, xi, p. 568].

The apricot gummosis recently reported [ibid., xiv, p. 559] occurs in all apricot sections of South Australia. The disease generally develops in association with a recent pruning cut; sometimes the tip of the leader dies back for a short distance, but if the disease starts in the lower part of a limb, gum exudes, and the bark dies and may split longitudinally near the junction of healthy and diseased tissue. Infection spreads more rapidly up and down than laterally, and nearly the entire

cross-section of a branch in time becomes diseased. When infection has progressed considerably along the branch the leaves wilt, but do not fall, and excision of the affected branch is no longer able to save the tree. Inoculations of wounded apricot branches of all ages with pure cultures of a fungus readily isolated from diseased material gave positive results. The fungus forms pycnidia with spores conforming to *Cytosporina*, but it is possible that other spores may also prove to be present.

In reviewing the investigations on tobacco mosaic and tomato spotted wilt [already noticed from other sources] it is stated that while no variety has been found resistant to the latter disease, *Lycopersicum pimpinellifolium* proved highly resistant in the field, but attempts at breeding from this species are so far unsuccessful. Other possibilities of control are briefly discussed.

Forty-sixth Annual Report for the fiscal year ended June 30, 1936.— *Bull. Wash. St. agric. Exp. Sta.* 342, 75 pp., 1936. [Received April, 1937.]

The following are among the references of phytopathological interest in this report [cf. *R.A.M.*, xv, p. 344]. Of 104 spring wheat varieties inoculated by E. F. Gaines and his collaborators with a mixture of 20 bunt [*Tilletia caries* and *T. foetens*] types [ibid., xvi, pp. 27, 28, 90, 165], four remained free from the disease, as well as a few durums and emmers. One of the 20 physiologic races attacked five out of ten resistant wheat strains, while six failed to infect any of the latter; the others were more or less virulent. Several Australian wheats remained healthy following inoculation with a mixture of all known bunt races. Seedlings of 26 wheat varieties inoculated with a composite of three bunt races generally sustained heavier damage from controlled freezing temperatures than plants from healthy seed.

The covered smut of slender wheat grass [*Agropyron tenerum*] was found by G. W. Fischer and collaborators to be due to *Ustilago bullata* [ibid., vi, p. 293] (the first record for the United States), and not to *U. bromivora* as reported from Canada [ibid., xv, p. 445]. Cross-inoculations between the smut on *A. tenerum* and that on brome grasses [*Bromus* spp.] gave negative results.

L. K. Jones and C. L. Vincent found that some degree of resistance to the veinbanding virus was shown by the Katahdin potato variety [ibid., xv, p. 460; xvi, p. 487] in the field, though it proved very susceptible to mechanical juice inoculation. This variety, moreover, was the only one out of ten to confer resistance on the progeny in hybridization tests, and therefore constitutes the most promising material for breeding work. Field infection by the veinbanding virus was very severe on the Gold Coin, Bliss Triumph, Irish Cobbler, and Warba varieties, less so on Russet Burbank.

The host range of enation mosaic of peas [see below, p. 583] was ascertained by L. K. Jones and F. Johnson to be much narrower than that of severe mosaic. Market-garden and canning peas in the western part of the State sustain the greatest damage from these disorders.

In C. D. Schwarze's and G. A. Huber's experiments a certain proportion of the offspring of crosses between resistant and susceptible

parents showed a high degree of resistance to raspberry mosaic [ibid., xvi, p. 194], amounting in some cases to immunity in the field.

F. D. Heald and H. English have been engaged on a study of the rots affecting pears (chiefly Bartlett, d'Anjou, and Winter Nelis) in certain districts producing comparatively small crops. Storage decay appears to be due mainly to the blue (*Penicillium* spp.) [ibid., viii, p. 49] and grey (*Botrytis* spp.) moulds [ibid., xiii, p. 246; cf. also xv, p. 701], though species of *Alternaria*, *Cladosporium*, *Dematium*, *Fusarium*, *Gloeosporium*, *Helminthosporium*, *Hendersonia*, *Mucor*, *Phoma*, *Phytophthora*, *Pleospora*, *Rhizopus*, *Sporotrichum*, *Stemphylium*, and a number of unidentified sterile fungi were also occasionally isolated. The lenticels were shown by inoculation experiments to be the usual channels of invasion.

No mosaic mottle was observed by F. D. Heald and R. Wellman on the foliage of apple trees producing bitter pit [ibid., xvi, p. 325] fruits during the previous season, or on that of any other apple trees in the Wenatchee district, though forms of the disease were detected on cherry [ibid., xv, p. 664], plum [ibid., xvi, p. 330], apricot [ibid., xiv, p. 368], and a number of shade trees.

Black root of strawberries [ibid., xv, p. 780] was found by F. D. Heald and collaborators at the Western Washington Experiment Station to be very prevalent as a consequence of severe winter conditions inducing freezing.

The following diseases, either new to the State or occurring with exceptional severity, were among those observed in the course of a phytopathological survey by the same workers: pea rust (*Uromyces fabae*) [ibid., xiii, p. 670] and leaf spot of lilac (*Phyllosticta syringae*) [ibid., vi, p. 754]—new records, cucumber mosaic [ibid., xv, pp. 385, 489, *et passim*], mosaics of red clover [*Trifolium pratense*: ibid., xvi, p. 84], lucerne [ibid., xv, p. 274], peach [see below, p. 543], *Catalpa*, poplar [ibid., xiv, p. 462], cabbage [ibid., xv, p. 444], and lupin [ibid., xiii, p. 317], witches' broom of lucerne [ibid., xv, p. 724], and 'pink cherry'.

A new disease of Cacao on the Gold Coast.—*Trop. Agriculture, Trin.*, xiv, 3, p. 84, 1 fig., 1937.

In this article, reprinted from *The Gold Coast Farmer*, v, 7 and 8, December, 1936, a new disease of cacao, termed 'swollen shoot and die-back', is reported from the Gold Coast, where it is said to be widely distributed in the New Juaben district of the Eastern Province. The young growing shoots (chupons) develop abnormal swellings, which may be over an inch thick, separated by constrictions one to several inches in length and sometimes less than $\frac{1}{4}$ in. thick. This symptom is followed by defoliation and die-back affecting all parts of the tree simultaneously; the young, deformed shoots dry up and wither, the growth of the pods becomes arrested, and the whole tree dies. The roots remain normal, except for occasional swellings resembling those found on the shoots. The disease occurs in patches up to 30 yds. in diameter, and trees in the early stage of the disease have been observed on the borders of the patches, so that there is some evidence of radial spread from a central point, though the cause of the trouble has not yet been ascertained.

It is proposed to cut out and burn all the diseased trees, together with a few apparently healthy ones at the circumference of each diseased area, compensation being paid to growers for the destruction of healthy trees, and also to plant windbreaks to protect the remaining trees from exposure.

LOWIG (E.). **Der Einfluss des Kieselsäuregehaltes auf den Mehltaubefall der Gramineen.** [The influence of the silicic acid content on mildew infection in the Gramineae.]—*Pflanzenbau*, xiii, 9, pp. 362–367, 1937.

The results of the writer's observations and experiments, initiated in 1930 under the leadership of [T.] Remy at the Bonn-Poppelsdorf Agricultural College, on the relation of the silicic acid content of wheat, oats, barley, and meadow grasses to mildew (*Erysiphe graminis*) are briefly summarized. Most of the data here presented have been noticed from other sources [*R.A.M.*, xiv, p. 571]. A minimum content of silicic acid of 1 per cent. of the dry weight was found to be necessary for the protection of the cereals against the disease, an amount considerably exceeding that commonly assimilated by these plants on poor sandy soils.

Die Verwendung von gebeiztem Saatgut 1935–36. [The use of disinfected seed-grain in 1935–6.]—*NachrBl. dtsch. PflSchDienst*, xvii, 3, pp. 24–25, 1937.

According to an article in *Wirtschaft u. Statistik* (January, 1937) [detailed tabulated data from which are given], an average of 55·7 per cent. of the total quantity of cereal seed-grain sown in the German Reich during 1935–6 was subjected to disinfection, 20 per cent. being treated by the liquid and 35·7 per cent. by the dry process. Winter wheat received more attention in this respect than any of the other cereals, only 9·9 per cent. of the total acreage being left untreated, followed by summer wheat, four-fifths of the total acreage of which was disinfected, whereas over two-thirds of the oat crop was sown without treatment; the proportion of treated seed-grain for the other cereals ranged from 38 to 75 per cent. It is estimated that some 940,000 tons of seed-grain were disinfected with chemical preparations during the period under review.

KORHAMMER (K.). **Entwicklung der Lohnbeizung in Westfalen.** [The development of co-operative disinfection in Westphalia.]—*Nachr. SchädlBekämpf., Leverkusen*, xii, 1, pp. 1–13, 7 figs., 1 map, 1937. [English, French, and Spanish summaries on pp. 41, 44–45, 48–49.]

Particulars are given of the great advance in the system of co-operative seed-grain disinfection [*R.A.M.*, xvi, pp. 444] in Westphalia [ibid., xii, p. 559], where the plants officially licensed [ibid., xiv, p. 736] for this treatment numbered 453 on 1st December, 1936, as compared with 63 on 1st April, 1928. From an inspection of treated material in 1936 it appeared that the disinfection process (mostly dusting with ceresan) had been correctly applied in 59·4 per cent. of the samples, whereas before the inauguration of official supervision errors either of excess or deficiency occurred in over 80 per cent. Thirty per cent. of

the installations in 1936 were in the hands of co-operative societies, the corresponding figures for mills and for grain merchants and the like being 33 and 37 per cent., respectively. Most of the seed-treating appliances referred to in this paper have already been mentioned in this *Review* from other sources; in addition to the dusting apparatus there are 76 continuously working short disinfection process machines in use.

SIBILIA (C.). **L'influenza della altitudine sulla presunta resistenza dei Grani alle ruggine.** [The influence of altitude on the presumed resistance of Wheat to rusts.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 4, pp. 271–277, 1937.

In view of the probability that wheat cultivation will shortly be undertaken by the Italians on the Abyssinian highlands the author reviews and discusses recent work in Kenya on the wheat rusts *Puccinia glumarum*, *P. triticina*, and *P. graminis* [*R.A.M.*, xv, p. 558; xvi, p. 87], and refers to similar work in India [ibid., xvi, p. 445] and Peru [ibid., ix, p. 234]. He considers that studies along the same lines should be begun in Abyssinia as soon as possible.

MACINDOE (S. L.). **The new era in breeding Wheats resistant to stem rust.**—*J. Aust. Inst. agric. Sci.*, iii, 1, pp. 25–31, 1937.

In this survey of the progress made in breeding wheats resistant to stem rust [*Puccinia graminis*] the author states that under Australian conditions the Kenya wheats have shown remarkable resistance, Kenya C. 6040 and its hybrids being practically immune and at the same time satisfactory in point of general agronomic characters, yield, and freedom from drought susceptibility and straw weakness. The resistance of the Kenya wheats has also been more easily recovered in back and multiple crosses than has that of any other parents. Of the advanced generation hybrids now available the most promising lines are from a Kenya × Florence × Dundee cross which is being submitted to field tests. Subsequent crosses of these with Pusa 4 and related lines promise to combine high baking quality with resistance, straw strength, and good yield.

NEWTON (MARGARET) & JOHNSON (T.). **Production of uredia and telia of Puccinia graminis on Berberis vulgaris.**—*Nature, Lond.*, cxxxix, 3523, pp. 800–801, 1 fig., 1937.

In the course of greenhouse inoculation studies with physiological races of *Puccinia graminis tricici* on the barberry made at Winnipeg in 1937, an F_3 culture of a cross between races 36 and 9, and identified as race 36, produced pustules with relatively few pycnidia and scant pycnidial nectar, and failed to produce aecidia in spite of all the attempts to induce their formation; 44 days after inoculation small uredosori were observed on the upper surface of the pustules on the barberry leaves, and further examination showed that of a total of 129 pustules, 50 contained uredosori and 21 of these contained teleutosori, mostly on the upper surface. In another series of tests, sporidia produced in the greenhouse in 1936 from a 1936 collection of race 21 of *P. graminis*, when inoculated on the barberry, gave rise to two types

of pustules, the first normal in every respect, while the pustules of the second were almost white, with no pycnidia or only rudimentary ones that rarely formed pycnidiospores; on five of these pustules uredosori were found, two of which also contained teleutospores.

While the failure of *P. graminis* pustules on the barberry to produce aecidia after intermixing of the nectar is not a new phenomenon, the production of uredo- and teleutospores on the barberry in association with this condition had not been observed hitherto. Both the uredospores and teleutospores on barberry are normal in appearance and the former are able to infect wheat but not barberry, so that the strains are still heteroecious.

Bever (W. M.). **Influence of stripe rust on growth, water economy, and yield of Wheat and Barley.**—*J. agric. Res.*, liv, 5, pp. 375–385, 3 figs., 1937.

As a result of greenhouse experiments during 1933 to 1935 at Moscow, Idaho, conducted on lines similar to those of Johnston and Miller [*R.A.M.*, xiv, p. 432] with leaf [brown] rust of wheat (*Puccinia triticina*), the author established that infection with stripe [yellow] rust (*P. glumarum*) in the early stages of growth of the susceptible spring wheat Chogat (C.I. 6244) and spring barley Pannier (C.I. 1330) greatly reduced and retarded the development of the plants, and also reduced the production of roots, the yield in grain and straw, the height of the plants, the size and number of heads, and the size and number of grains. For infection at the one-leaf seedling stage the weight of the roots of the two hosts was reduced by 87·6 and 75·9 per cent., that of the total dry matter by 55·7 and 48·7, and the yield of grain by 65·1 and 64·5 per cent., respectively. The quantity of water used per unit of weight was greatly increased. The depressing effect of the rust was much less when infection was delayed, but even with infection as late as at the anthesis stage the reduction in weight of roots and grain was material, the amount of injury being apparently related primarily to the earliness of the stage of development of the hosts at the time of inoculation, rather than to the amount of rust that developed, since this was much the same for all the inoculation groups. Apart from reducing the size and number of the ears and of the grains, the rust also had a shrivelling effect on the latter. Yellow rust had a similar, though less marked, effect on the resistant wheat Garnet (C.I. 8181) and barley Khanaka (C.I. 743), even when very few pustules appeared on the plants; the weight of the roots of wheat was reduced by 24·5, that of dry matter by 18·2, and that of the grain by 31 per cent. In the barley the reductions were somewhat smaller. These results are strikingly similar to those of Johnston and Miller for *P. triticina* [loc. cit.], but this species produces no shrivelling of the grains, merely reducing their size.

Stefanovski (I. A.). Устойчивость Пшениц к бурой ржавчине в условиях Заволжья. [Resistance of Wheat to brown rust under Trans-Volga conditions.]—*Bull. appl. Bot. Select., 1937*, Ser. A, 21, pp. 43–52, 1937.

This is a detailed report of the author's investigations in the Lower

Volga basin of the influence of environmental conditions on the development of brown rust (*Puccinia triticina*) on a large collection of wheat varieties and species, a full summary of which has been noticed from another source [*R.A.M.*, xv, p. 708].

KARGAPOLOVA (Mme N. N.). Химические особенности различных видов Пшеницы в связи с их устойчивостью к **Puccinia triticina Eriks.** [Chemical peculiarities of different species of Wheat in relation to their resistance to *Puccinia triticina* Eriks.]—*Bull. appl. Bot. Select., 1937,* Ser. II, 11, pp. 179–199, 1937. [English summary.]

This is a full report of the author's investigation of the resistance of certain species and varieties of wheat to brown rust (*Puccinia triticina*), a summary of which has been noticed from another source [*R.A.M.*, xvi, p. 26]. In addition to the information already imparted, it is stated that biochemical studies indicated that of the polyphenols contained in wheat plants, pyrocatechuic phenols are chemically the most active; under the action of autoxidation and of oxidizing enzymes they form persistent tannins, the increasing accumulation of which is believed probably to be one of the most important factors in the resistance of certain plants to fungal diseases. Tests carried out with Dubosque's colorimeter showed a considerably higher content in phenolic compounds in wheat varieties immune from or resistant to brown rust than in the susceptible (the difference between the standard and the tested solutions being 32 to 39 colorimetric units for the former, as against 0 to 10 units for the latter). It was further shown that the individual pure phenols vary widely in their toxic properties to the *P. triticina* spores, the most toxic being hydroquinone and pyrocatechin, and that the acetic-ethyl fraction of the resistant wheat forms is highly toxic as compared to that of the susceptible forms.

ROUSSAKOFF (L. F.). Канред × Фулькастер **266287** и другие американские сорта Пшеницы, устойчивые к бурой ржавчине. [Kanred × Fulcaster 266287 and other American Wheat varieties resistant to brown rust.]—*Bull. appl. Bot. Select., 1937*, Ser. A, 21, pp. 31–42, 1937.

A fully tabulated account is given of field experiments and observations from 1929 to 1936, the results of which showed that in the important wheat-growing regions extending from the Northern Caucasus to the Azoff Sea, certain American (Kansas) wheat hybrids, such as Fulhard, and the Kanred × Fulcaster Nos. 266324, 266319, 266313, and more especially 266287, were outstanding in their resistance to brown rust [*Puccinia triticina*], except in 1931, when one or more hitherto unknown physiological races of the rust made their appearance in the Kuban area, but disappeared later; they also gave high yields. Kanred × Fulcaster 266287 was also normally resistant to *Septoria tritici* and *S. graminum*, and appeared to be well adapted to the local ecological conditions, for which reasons its wider cultivation is advocated over the greater extent of the regions considered, where brown rust is economically the chief wheat disease. It is not suited, however, to the wetter areas, since in 1936 it showed distinct susceptibility to black

and yellow rusts [*P. graminis* and *P. glumarum*] and also an inclination to lodging.

WIEBE (G. A.). **The degree of bunt resistance necessary in commercial Wheat.**—*Phytopathology*, xxvii, 3, 313–314, 1937.

The presence of modifying factors in the composition of certain hybrids resistant to bunt (*Tilletia tritici*) [*T. caries*] having been shown to induce a slight degree of susceptibility to the disease [*R.A.M.*, ix, p. 446], an experiment was conducted at the California University Farm to determine the possible bearing of this phenomenon on the breeding of such lines for commerce. Two strains were used, one from the highly resistant Martin×White Federation (susceptible), and the other from Martin×Sonora (susceptible), the seed being heavily inoculated in 1934 with spores of physiologic race III of *T. caries* [ibid., vii, p. 369] and planted for two successive years without any further addition of inoculum. The bunt percentages in 1934, 1935, and 1936 for Martin×White Federation were 0·8, 0·0, and 0·0 respectively, the corresponding figures for Martin×Sonora being 5·6, 0·4, and 0·0, respectively; for White Federation and Sonora (used as controls) the percentages were 51·8, 63·7, and 65·9, and 78·1, 71·6, and 77·2, respectively. Conditions were favourable for the disease throughout the period of the trials, and it is evidently unnecessary to discard hybrid strains of the foregoing types on account of a commercially negligible tendency to slight infection.

ASHLEY (J. N.), HOBBS (BETTY C.), & RAISTRICK (H.). **Studies in the biochemistry of micro-organisms. LIII. The crystalline colouring matters of Fusarium culmorum (W. G. Smith) Sacc. and related forms.**—*Bio-chem. J.*, xxxi, 3, pp. 385–397, 1937.

The colouring matters present in the mycelium of *Fusarium culmorum*, *F. c.* var. *cereale*, *F. c.* var. *lethaeum* [*F. culmorum*], and of *F. graminearum* [*Gibberella saubinetii*] isolated by G. W. Padwick from wheat in Canada have been investigated. The optimum temperature for development and pigmentation was 24° C. All the forms yielded a brilliant carmine pigment, the colour of which changed to golden-yellow on acid and to purple on alkaline substrata. Two distinct colouring substances were isolated, a crystalline red pigment in the form of glistening plates designated 'rubrofusarin', $C_{15}H_{12}O_5$, m.p. 210°–211°, and the other a golden-yellow, prismatic, micro-crystalline pigment, 'aurofusarin', $C_{30}H_{20}O_{12}$, m.p. above 360°. A third substance, culmorin, $C_{15}H_{26}O_2$, m.p. 175°, consisting of thick, colourless needles, was isolated from one strain of *F. culmorum*.

HYNES (J. H.). **Technical notes. Studies on 'take-all' of Wheat. I.**—*J. Aust. Inst. agric. Sci.*, iii, 1, pp. 43–48, 1937.

In this further account of his studies of *Ophiobolus graminis* in relation to wheat root rot in New South Wales [*R.A.M.*, xiv, p. 622; xvi, pp. 305, 373], the author states that isolation in pure culture is most readily effected by crushing a small portion of a basal wheat sheath bearing mature perithecia and free from soil particles in a drop of sterile water on a glass slide, transferring a loop of spores to a second

drop, and then a further loop to a third drop. A final loop from this last drop is placed in a tube of liquid 2 per cent. dextrose agar at 40° C., and the plate poured and incubated at 25°.

The development of perithecia in artificial culture was very rare, but readily occurred when the moistened butts of diseased plants were kept in Erlenmeyer flasks under laboratory conditions. Six strains of the fungus were differentiated on the basis of colony characters and pathogenicity tests on Hard Federation, Canberra, and Marshall's No. 3 wheat, Algerian and Lachlan oats, Cape barley, and Black Winter rye showed that the six strains were distinct in their effects on the cereals, strains A and B being generally the least and most virulent, respectively, of those tested. Wheat, barley, and oats were very susceptible to infection, while oats were resistant to four of the strains. Under the experimental conditions wheat and oats gave evidence of varietal differences in susceptibility.

STRAIB (W.). **Zur Frage der auf Hordeum murinum L. vorkommenden Rostarten und der Selbständigkeit von Puccinia hordei Fuck.** [A contribution to the question of the rust species occurring on *Hordeum murinum* L. and of the independence of *Puccinia hordei* Fuck.]—*Ber. dtsch. bot. Ges.*, lv, 2, pp. 120–125, 1937.

Puccinia glumarum, *P. graminis tritici*, and *P. hordei* Fuck. [*P. fuckelii*: *R.A.M.*, xv, p. 209] occurred on *Hordeum murinum* in the open in 1936, and the independence of the last-named rust was demonstrated by uredospore inoculation experiments in which it failed to infect rye, wheat, barley, and oats, while conversely its own host was not attacked by *P. dispersa* [*P. secalina*], *P. triticina*, or *P. simplex* [*P. anomala*: ibid., xiv, p. 624, and next abstract]. Specimens of *H. murinum* infected by *P. glumarum* were received from France (physiologic race 33), Chile (30), and Turkey (20).

CHRISTENSEN (J. J.) & DAVIES (F. R.). **Nature of variation in Helminthosporium sativum.**—*Mycologia*, xxix, 1, pp. 85–99, 3 figs., 1937.

In these studies on the nature of the variation commonly occurring in *Helminthosporium sativum* and other dark-spored species of the same genus [*R.A.M.*, xii, p. 782], it was found that the conidia and germ-tubes of *H. sativum* are multinucleate, while the hyphal cells are uni- to multinucleate and the young conidiophores usually uninucleate. All the nuclei in the conidia produced on the same conidiophore may possibly derive from the same nucleus and be genetically alike. True hyphal fusion with the cell walls completely broken down was ascertained to be common between races of *H. sativum*, but rare between *H. sativum* and other dark-spored species of the genus. Pseudo-fusion of the hyphae (hyphal adhesion of Buller) between species of *Helminthosporium* was not unusual.

Cultural comparison of 207 hyphal-tip isolates from 103 germinating conidia from colonies giving rise to variants and from mixed colonies on agar drops showed all the isolates from a single conidium to be identical with the original culture. Similar comparison of 524 conidial isolates from 205 individual conidiophores from mixtures of two races

or species on agar drops or from colonies derived from barley tissues infected with two or more races or species of *Helminthosporium* showed that, with two exceptions, all the isolates from the same conidiophore were culturally identical.

Under certain conditions, particularly when grown on a bacteria-staled medium (50 to 100 c.c. of a dead bacterial culture per l. of potato dextrose agar) most of the progenies from hyphal tips and from conidia gave rise to many variants, either as patches or fan-shaped sectors. One race of *H. sativum* cultured for 17 years yielded 81 varieties from 17 colonies on the staled medium whereas none occurred in 17 control colonies on standard potato dextrose agar. Evidently therefore variation can be induced by environmental factors. No indication was afforded of any stimulus to variation by growing two or more races together on agar or in the host and isolates from mixed cultures sectored no more frequently than the original races. The authors conclude from the evidence obtained that variation in *H. sativum* is primarily due to mutation (gene change or chromosomal aberration) rather than heterocaryosis, though the possibility of the latter is not excluded.

Christensen (J. J.) & Kernkamp (H. C. H.). **Studies on the toxicity of blighted Barley to swine.**—*Tech. Bull. Minn. agric. Exp. Sta.*, 113, 28 pp., 3 figs., 1936. [Received June, 1937.]

Investigations into the toxicity to pigs of barley affected by blight (*Alternaria*, *Helminthosporium*, and *Fusarium* spp.) or scab (*F.* spp., chiefly *F. graminearum* = *Gibberella saubinetii*) [*R.A.M.*, xiii, p. 157; xiv, p. 434] in Minnesota showed that a water extract of 15 gm. of scabbed kernels (*Fusarium* spp.) administered orally by means of a stomach tube induced vomiting in a pig weighing 100 lb., while sterile extracts from scabbed barley injected intravenously and intraperitoneally caused some sickening. Extracts from pure cultures of species of *Fusarium* on various artificial media or on mature barley grain were not toxic to pigs, but pure cultures of *Fusarium*, *Alternaria*, *Chaetomium*, *Penicillium*, *Helminthosporium*, and bacteria grown on steamed barley were refused unless mixed with other food. *G. saubinetii* inoculated into wheat, barley, and maize at grain formation produced a water-soluble, thermostable toxic principle which persisted in barley for at least three years. Barley containing 31 per cent. by weight of blighted kernels (primarily *Helminthosporium* and *Alternaria* spp.) was not toxic to pigs, but the feeding value of sound barley was much reduced when 10 per cent. (by weight) of scabbed (*Fusarium* spp.) kernels were added. Barley naturally infected with 16 per cent. scab was highly toxic to pigs, which refused to eat barley with 32 per cent. scab.

In Minnesota the prevalence of the fungi causing blight or scab varies markedly from year to year and from one locality to another in the same year, scab being most common and destructive in the southern part of the State. Rainfall is the most important factor influencing the type and degree of infection. Many of the most shrivelled and consequently most toxic grains can be removed by fanning or by immersing the grain in water and skimming off the blighted seeds that float on the surface. Some indication was obtained of detoxication

under certain conditions by the addition of milk, starch, and other materials. Soaking and washing the infected grain also removed some of the toxic principle.

Pukhalski (A. V.). Повреждение озимой Пшеницы и Ржи грибком "Склеротиния". [Injury to winter Wheat and Rye caused by the fungus '*Sclerotinia*'.]—*Bull. appl. Bot. Select., 1937,* Ser. A, 21, pp. 53–61, 4 figs., 1937.

After giving a brief account of a serious outbreak of *Sclerotinia graminearum* [*R.A.M.*, xv, p. 566] in 1936 on winter-sown wheats and rye in the Kirov [formerly Vyatka] region of the U.S.S.R. and in the Udmurtskaya Autonomous Soviet Republic, which in many cases destroyed whole fields of the two crops, the author states that by germinating sclerotia of the fungus on moistened cotton wool at 6° to 8° C. he succeeded in inducing them to produce apothecia; these vary considerably in shape and size in dependence on environmental conditions, and in particular require moist conditions to mature; the sclerotia require a resting period of four to five months before germinating. Observations indicated that the disease is most severe on poor and insufficiently cultivated soils, and that late winter sowings are the most liable to injury. While no entirely immune variety has yet been found in the wide range of wheats and ryes tested, certain selections from Finland, Sweden, Denmark, Holland, Switzerland, and the United States, as well as local varieties in the north-eastern districts of the U.S.S.R., gave clear indications of relative resistance, which might be increased by breeding.

Zaleski (K.) & Walisiak (J.). **Pleśniaki występujące na ziarnie Żyta i ich znaczenie chorobotwórcze.** [Moulds occurring on Rye grain and their pathological significance.]—*Roczn. Nauk rol.*, xli, 2, pp. 445–452, 1937. [English summary.]

A summarized account is given in this report of laboratory and field experiments to test the germinability and development of rye seed-grain showing infection with moulds and bacteria, or mechanical injury. Carefully controlled isolations showed the presence on the grain of six species of *Penicillium* (including five species which are provisionally considered as new to science, to be described in a future publication), *Fusarium udum* var. *solani* [*F. merismoides*], *F. metachroum* [*F. avenaceum*], *F. subulatum* [*F. avenaceum*], *F. effusum* [*F. avenaceum*], and *F. lucidum* [*F. avenaceum*: *R.A.M.*, xv, p. 643], and *Alternaria tenuis*. They further showed that species of *Penicillium* and bacteria were predominant in seeds exhibiting pink discoloration, instead of species of *Fusarium*, as had been expected. In pot cultures the seed-grain germinated poorly, and gave low yields both in straw and in grain, but in the field it gave normal stands and yields, a possible explanation being that dry conditions prevailed during the two seasons, which did not allow the development of the moulds during the germination of the rye. Further tests showed that treatment of the black- and pink-discoloured grain with two proprietary disinfectants considerably reduced germination, a fact which may be in part attributed to the seed being mechanically injured; it was also experimentally shown that the

preparations had little, if any controlling effect on the fungi, with the possible exception of *Alternaria*, infection by which was reduced from 23 per cent. in the controls to 16·5 per cent. in the treated lots.

McDonough (E. S.). **Primary infection of Setaria italica (L.) Beauv. by Sclerospora graminicola (Sacc.) Schroeter.**—*Phytopathology*, xxvii, 3, pp. 311–313, 2 figs., 1937.

A preliminary note is given on the mode of infection of *Setaria italica* by *Sclerospora graminicola* [*R.A.M.*, xv, p. 646] under experimental conditions simulating those existing in the soil in nature. Seeds of the Siberian variety were covered with oospores of the fungus collected from standing *Setaria viridis* plants and sown on moist cotton in Petri dishes, and at 24-hour intervals from the inception of germination of the seeds material was fixed and examined histologically. The epidermal cells of the root, coleorhiza, mesocotyl, or coleoptile were directly penetrated by the germ-tube or a branch of it. In most cases contact had already been established between the infection hypha and the outer cell wall before the actual occurrence of penetration. For a time the further growth of the fungus was intracellular, but subsequently an intercellular course was pursued. From the root or coleorhiza the pathogen grew into the cotyledonary (scutellary) node and thence into the first internode. Once within the stem the growth of *Sclerospora graminicola* was directed almost exclusively towards the embryonic region, the path taken by the mycelium being either in the cortex or the stele. Ultimately ingress is gained to the young leaves and branches. The results of this study indicate that the primary root and the coleorhiza are the parts of the seedling most commonly affording entrance to the downy mildew fungus.

Baker (R. E. D.). **Citrus scab on Marsh Grapefruit.**—*Trop. Agriculture, Trin.*, xiv, 3, p. 69, 1937.

Citrus scab (attributed on sour orange to *Sporotrichum citri* [*Elsinoe fawcetti*]), hitherto found on Trinidad grapefruit only in isolated instances [*R.A.M.*, xiv, p. 627], was observed in January, 1937, on between 200 to 300 three-year-old Marsh grapefruit trees in the Northern Range area of the island. The fungus was morphologically identical with *S. citri* as found on sour orange, the spores on both hosts measuring 8 to 18 by 2·5 to 5 μ, these measurements agreeing, however, with those given by Miss Jenkins for *Sphaceloma fawcettii scabiosa* [ibid., xvi, p. 169] i.e., 10 to 17 by 2·5 to 5 μ. The outbreak is probably developed as a sequel to abnormally wet weather conditions.

Biraghi (A.). **Notizie e considerazioni su alcuni Agrumi a frutto acido osservati negli Stati Uniti d'America.** [Notes and considerations on acid Citrus fruits observed in the United States of America.]—*Nuovi Ann. Agric., Roma*, xvii, 1, pp. 103–114, 1937.

Notes are given on the characteristics of the various types of lemons and limes (*Citrus aurantiifolia*) and their hybrids seen by the author during a journey made through California and Florida to collect material to be tested for resistance to mal secco (*Deuterophoma

tracheiphila) [*R.A.M.*, xvi, p. 313] in Italy. The Persian lime, known in Florida as the Tahiti, and in California as Bear's Seedless lime, is hardier than other limes or lemon, and is stated to be immune from scab (*Sphaceloma fawcettii*) [*Elsinoe fawcetti*: ibid., xii, p. 202, and preceding abstract] and anthracnose (*Gloeosporium limetticolum*), though subject to a gummosis, probably of fungal origin, that may affect 10 per cent. of the trees in a plantation, sometimes with fatal results. The Perrine lemon, the result of a cross made in 1909 by W. T. Swingle, between lime and Genoa (Eureka) lemon appeared to be the most promising form found as regards the development of types resistant to mal secco; it is very vigorous, much hardier than lime or true lemon, and immune from scab and anthracnose. The material collected was sent to Italy for further study.

Boron as an essential element in the healthy growth of Citrus.—*Rhod. agric. J.*, xxxiv, 3, p. 166, 1937.

Mature citrus trees on the Mazoe estate, Southern Rhodesia, have long been affected by a condition resulting in so-called 'hard' fruit. The disease, which is slowly progressive, is characterized in its extreme form by marked defoliation, die-back, and small leaves with minute indentations on the ventral surface. Most of the crop is shed between October and December, and the fruits that remain on the tree are commercially valueless by reason of their unshapely appearance and the arrested development of the internal tissues. Gum pockets or corky patches are always present, the absence of juice accounting for the term 'hard' fruit. The condition is aggravated by high temperatures, low humidity, and a soil type allowing rapid drainage. Light applications of borax to the soil have been found by Dr. A. A. Morris of the British South Africa Company to induce a conspicuous recovery in Valencia late [orange] trees in all stages of the disease.

BATES (G. R.). **Report of the Plant Pathologist for the year ending December 31st, 1935.**—*Rep. Brit. S. Afr. Co., Mazoe Citrus exp. Sta., 1935*, pp. 65–72, 1 pl., 1936. [Received May, 1937.]

Further studies in Southern Rhodesia on the infection of oranges by *Penicillium digitatum* [*R.A.M.*, xv, p. 715; xvi, p. 233] showed that perfectly sound, freshly picked fruits can be infected through the cut stem end using an aqueous spore suspension; more infection occurred at 60° F. than at 77°, and at 48° no infection had occurred after six weeks. Fruits wilted for several days beforehand were more resistant than freshly picked fruits, resistance differing with the variety, and ethylene-coloured fruit was generally more resistant than wilted fruit.

The most salient feature of the season's storage tests was the small amount of pitting, nearly all the injury present being of the scald type. The scald markings were pale to rich dark brown, roughly circular, with an irregular margin, and did not pass below the flavedo; in later stages, when the oil vesicles had collapsed, they were sunken. The difference in the types of injury that prevailed in the 1934 and 1935 tests may have been due to different storage conditions, most of the

tests being made at 40° and 48° in 1935 and at 36° and 40° in 1934, while the mean humidities used in the former year were about 65 and 50 per cent. relative humidity as against 75 and 70 per cent. in 1934. The only example of severe pitting found in 1935 was on Valencia oranges stored at 36°; in all the other experiments only traces of pitting occurred at 40° and none at 48°. Pre-storage treatment markedly affected scald development; ethylene-treated fruit developed only a negligible amount of scald under all storage conditions, long-wilted fruit showed very severe scald, injury increasing with increased period of wilting, and freshly picked fruit, especially if unwrapped, was also highly susceptible. Very little decay was due to *P. italicum* and *P. digitatum*. Stem-end, lateral, and centre rots, largely caused by *Colletotrichum gloeosporioides* and *Alternaria citri*, were unimportant during the first ten weeks' storage [ibid., xv, p. 716]. *Diplodia natalensis*, *Phomopsis* [*Diaporthe*] *citri*, and species of *Fusarium* were occasionally isolated.

Paper wrappers containing 8 and 15 per cent. mineral oil gave, respectively, slight and high control of pitting among Valencia oranges stored at 36°, though the former were no more effective against scald than plain sulphite wrappers, and the latter were injurious.

A localized outbreak of die-back among young Premier orange trees associated with concentric ring blotch on the foliage and *C. gloeosporioides* on the twigs, branches, and leaves was successfully controlled by destroying the severely diseased trees and pruning out suspected infections in the remainder.

Inoculations with a normal strain of *Phytophthora citrophthora* isolated from typical gummosis lesions on Washington Navel oranges budded on rough lemon on the Mazoe estate gave positive results in every instance, the fungus being reisolated from the inoculated trees. Infection apparently is active only under certain conditions, usually dying out before seriously affecting the tree.

Psorosis [ibid., xvi, p. 451], one of the most serious diseases of citrus trees in Southern Rhodesia, occurs on the Mazoe estate chiefly on the Valencia Late orange variety, certain groves in the northern section of the estate being most severely affected. In six years' tests with fungicidal remedies not one affected tree has fully recovered, the disease being apparently more virulent locally than elsewhere.

TAMMES (P. M. L.). **De bestrijding van de bladvlekkenziekte bij jonge Klappers.** [The control of the leaf spot disease in young Coconuts.]—*Landbouw*, xiii, 2, pp. 69–73, 1 fig., 1937.

The writer's observations in Java indicate that freedom from grey spot or leaf blight of coco-nuts (*Pestalozzia*) [?*palmarum*: *R.A.M.*, xv, p. 15] may be ensured by the provision of light shade, e.g., *Sesbania grandiflora* cuttings, during the first two years after planting. Such conditions frequently obtain in native plantings, where the seed nuts are kept under shade in the gardens or planted out in maize fields. In a test in 1936 the incidence of infection in shaded plots was only 2 per cent. compared with 46 per cent. in exposed sites. Excessive shade, however, should be avoided as tending to weaken the development of the plants.

Muller (H. R. A.). **Bestrijding van topsterfte.** [Control of top die-back.]—*Bergcultures*, xi, 13, p. 432, 1937.

Some misconceptions are likely to arise through W. Rudin's interpretation of the writer's method of combating top die-back of coffee [*Rhizoctonia*] in Java [*R.A.M.*, xvi, p. 453], the essential feature of which consists in the removal, not only of diseased or suspected leaves, but of the entire branch bearing them. Reasonably deep pruning cuts are necessary for the total excision of infected material, in the recognition of which the coolies rapidly become so practised that mistakes are seldom or never made.

Karpiński (J.). **Próby walki z chrabąszczem (Melolontha sp.) za pomocą grzyba Beauveria densa Pic.** [Experiments on the control of the cockchafer (*Melolontha* sp.) by means of the fungus *Beauveria densa* Pic.]—*Roczn. Nauk rol.*, xli, 2, pp. 383–386, 1937. [German summary.]

The experiments in 1934–5, summarized in this note, showed that under laboratory conditions the cockchafer (*Melolontha melolontha*) was much less resistant to infection with *Beauveria densa* [*R.A.M.*, xv, p. 217] than *M. hippocastani*, as indicated by the length of the relative survival of the two species after infection; in the end, however, all the experimental insects perished, and *B. densa* was recovered from all the bodies. Infected females of the two species either did not lay any eggs at all, or did so very exceptionally, a fact which was confirmed in field experiments. In a forest, in which an infection focus by *B. densa* was artificially established, the percentage of dead cockchafers infected by the fungus was found to be 24·5 within a distance of 1 km. from the focus, 19·2 within the second km., 11·2 within the third, 5·8 within the fourth, gradually decreasing up to the seventh km., where no infected insects could be found. The infection, however, did not penetrate through the soil to the grubs.

Masera (E.). **Action pathogène de bactéries et de champignons entomophytes sur le Bombyx mori L.** [The pathogenic action of entomogenous bacteria and fungi on *Bombyx mori* L.]—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 1–2, pp. 22–24, 1937.

When three lots, each of ten individuals, of silkworms (*Bombyx mori*) in the fifth larval stage, at which period they are more susceptible to infection, were exposed to the action of a number of entomogenous fungi and bacteria (*a*) by inoculation [method not stated], (*b*) by ingestion of spores on infected leaves, and (*c*) by epidermal contact, the following results were obtained. Inoculation with *Bacillus prodigiosus* [*R.A.M.*, xvi, p. 37] killed all the silkworms in 24 hours, ingestion killed seven in four days, and contact had no effect. With *Coccobacillus acridiorum* [ibid., xvi, p. 251] the corresponding figures were (1) all dead in 48 hours, (2) six dead, two in the cocoon stage, and (3) no effect. *Beauveria bassiana* [ibid., xv, p. 217] killed all the larvae in all three tests, in the cocoon stage. Inoculation with *B. globulifera* [ibid., xvi, p. 456] caused mycosis and death of all ten larvae, while five others died after ingestion and four as a result of contact. *Sporotrichum paranense* [ibid., xvi, p. 250] caused mycosis and death by the inoculation method

only. *Bacillus subtilis* [ibid., xvi, p. 482], *Beauveria densa* [see preceding abstract], *Cephalosporium lecanii* [ibid., xiv, p. 98; xvi, p. 37], *Myriangium duriaei* [ibid., xv, p. 216], and an unidentified *Fusarium* parasitic on the eggs of *Schistocerca paranensis* had no effect. Thus the only organism not previously known to be pathogenic to silkworms found fatal in these experiments was *Sporotrichum paranense*.

SIEMASZKO (W.). **Studja nad grzybami owadobójczemi Polski.** [Studies on entomogenous fungi of Poland.]—*Arch. Nauk biol.*, vi, 1, pp. 1–82, 3 pl., 7 figs., 1937. [English summary.]

The largest part of this small monograph on entomogenous fungi occurring in Poland is devoted to the genus *Beauveria* which was studied by the author both on Polish material and on cultures received from the Centraalbureau voor Schimmelcultures in Baarn. Of the ten species of *Beauveria* described hitherto as attacking insects, he accepts three, namely, *B. bassiana*, *B. globulifera*, and *B. densa* [see preceding abstracts], each consisting of a number of strains differing from one another in pure culture. Three strains of *B. bassiana* were differentiated in Poland: one on the caterpillar of *Cossus cossus*, the second on the caterpillars of *Carpocapsa* [*Cydia*] *pomonella*, and the third on the beetle *Ortholeura sanguinicollis*; the globose or broadly oval conidia of these strains measured 1·9 to 2·75 (average 2·4) μ for the first, 1·9 to 3 (average 2·36) μ for the second, and 2·2 to 3·3 (average 2·7) μ for the third. None of these strains coloured potato slices and all produced mealy or chalky, flat colonies on both potato slices and nutrient glucose agar. *B. stephanoderis* [*R.A.M.*, v, p. 427] occurring on *Stephanoderes hampei* and other beetles and on Lepidoptera, is stated to be merely a strain of *B. bassiana*. *B. globulifera* is distinguishable from *B. bassiana* by its elevated cottony growth. It occurs on a number of Polish insects in two forms, one of which stains potato slices a vinaceous-purple colour, and the other does not discolour them. The first form includes five strains, one found on *Leptura*, another on *Strophosomus*, and three others on various insects living on or under the bark of trees. The second form comprises two strains, one on *Hylobius abietis*, and the other on *C. pomonella* and other insects. The conidia of all the Polish strains are globose and measure 2·2 to 2·5 μ in diameter. It is considered that *B. effusa* [ibid., xv, p. 217] is not an independent species, but represents a series of strains of *B. globulifera* staining potato a vinaceous-purple; *B. vexans* is also considered to belong to this strain, and *B. delacroixii* (Sacc.) Petch on the migratory locust [*Locusta migratoria migratorioides*] and *B. doryphorae* [loc. cit.] (with 60 per cent. globose conidia) on the Colorado beetle [*Leptinotarsa decemlineata*] are stated to belong to the second form of *B. globulifera*. *B. densa* has elliptical spores and imparts a vinaceous-purple tinge of varying intensity to potato. In discussing the synonymy of this fungus, it is considered that only *Botrytis tenella* and *Isaria densa* can be accepted as definite synonyms of *Beauveria densa*; *Sporotrichum densum* Link is an uncertain species and should be removed from the synonyms. *B. brongniartii* (Sacc.) Petch from the migratory locust is only a strain of *B. densa*.

In giving details of his infection experiments (mostly by dusting the insects with spores), the author states that the bark beetle *Ips*

typographus was successfully infected with spores of *B. bassiana*, *B. globulifera*, and *B. stephanoderis* (culture from Baarn) but not with spores of *B. effusa* (from Baarn) or of *B. densa*. Inoculations with *B. bassiana* and *B. globulifera* were also mostly successful on a number of other insects.

Of the two species of *Spicaria* (*Isaria*) which occur in Poland, *S.* (*I.*) *farinosa* [ibid., xvi, p. 250] is the most common; in agreement with Petch, the author established that this species does not include special forms or strains; in pure culture it is possible to obtain the non-coremial downy forms (*Spicaria*) from the coremial (*Isaria*), and *vice versa*. *S.* (*I*). *fumoso-rosea* [ibid., xvi, p. 37] was found in Poland on *Melolontha melolontha*, and was shown experimentally to attack easily the caterpillars of *C. pomonella*, *Deilephila euphorbiae*, and *Liparis dispar*. *S. aphodii* Vuill. and *S. cossus* Portier & Sartory, described in 1910 and 1916, respectively, are stated to be synonymous with *S. fumoso-rosea*. *Metarrhizium anisopliae* [ibid., xv, p. 499] was found on *M. melolontha* and *Anomala aenea*, this being the first record of the fungus from Poland.

After briefly considering the problems involved in the control of noxious insects by means of entomogenous fungi, the author terminates with a concise discussion of the posthumous notes by Wanda Konopacka on *S.* (*I.*) *farinosa* and *Cordyceps militaris*, and states that her pencil drawings of the conidial fructifications which she obtained in pure cultures of *C. militaris* clearly show that they cannot be referred to *I. farinosa* [cf. ibid., xvi, p. 250].

The paper is supplemented by a list of 55 Polish and foreign insect hosts and their fungus parasites, and by a second list of entomogenous fungi with their synonyms.

Kobayasi (Y.). **On the specific connection of Cordyceps entomorrhiza and Tilachlidiopsis nigra.**—*Bot. Mag., Tokyo*, li, 603, pp. 97–102, 2 figs., 1937.

Two specimens of *Tilachlidiopsis nigra* with stromatiferous fruit bodies were found on the ground beneath deciduous trees near Tokyo in 1936. The 50 specimens of the fungus hitherto collected represented the conidial stage only, and advantage was taken of this opportunity for a comparison of *T. nigra* with another parasite of the Carabidae (Coleoptera), *Cordyceps entomorrhiza* (Dickson) Link. The conclusion reached as a result of an examination of the stipe, stromatic heads, perithecia, and conidia of the two fungi is that they are 'connected species' rather than the same species, one being possibly derived from the other.

Full citations to the literature and synonyms are given of *C. entomorrhiza* (syn. *C. cinerea*) [*R.A.M.*, xii, p. 567] and its conidial forms *Stilbella setiformis* and *Hirsutella eleutheratorum* [ibid., xi, p. 573], and of *T. nigra* (syn. *Isaria nigra*) [ibid., ix, p. 524].

Salgues (R.). **Les propriétés fongicides préventives du bleu de méthylène en pathologie animale.** [The fungicidal preventive properties of methylene blue in animal pathology.]—*C.R. Acad. Sci., Paris*, cciv, 9, pp. 721–723, 1937.

Particulars are given of an epidemic of thrush in white Wyandotte

chickens, caused by *Monilia* [*Candida*] *albicans* [*R.A.M.*, xiii, p. 510; xvi, p. 382], associated in a few instances with *Oidium* [*Oospora*] *lactis* [ibid., xii, p. 371], which was experimentally shown to be preventable by the consumption of wheat grain treated with methylene blue. The same substance, at a strength of 1 per cent., was used with beneficial results on sorghum grain infected by *Cintractia* sp., which had been causing nervous derangements in sheep.

REDAELLI (P.), CIFERRI (R.), & CAVALLERO (C.). **Une souche humaine Torulopsis colliculosa (Hartmann) Saccardo.** [A human strain of *Torulopsis colliculosa* (Hartmann) Saccardo.]—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 1–2, pp. 29–31, 1937.

Examination of *Monilia* [*Candida*] *albicans* C. 337, from the American Type Cultures Collection, Chicago, isolated from the sputum of a tuberculous patient [*R.A.M.*, xvi, p. 484] showed it to have cultural, morphological, and biochemical characters agreeing with those of *Torula colliculosa* Hartmann, renamed *Torulopsis colliculosa* by Saccardo in 1906. The spherical or slightly ovate blastospores average 3 to 4 μ in diameter, and are either separate or grouped in twos or threes in hanging drop cultures. The fungus was found to be capable of fermenting levulose, glucose, mannose, maltose, raffinose and saccharose (slightly), and liquefying gelatine, and was shown by inoculation to be fatal to rabbits. *T. colliculosa* resembles *Saccharomyces lemonnieri*, isolated in France from a human lung affection, in the size and shape of the blastospores, its biochemical and cultural characters, and its pathogenicity to laboratory animals, but it does not produce asci whereas *S. lemonnieri* forms tetrasporous asci.

VAN DER VEER (A.). **Mold spores in asthma and hay fever.**—Abs. in *J. Allergy*, viii, 3, p. 277, 1937.

A chart of mould counts for the summer of 1936 showed no particular seasonal influence for any of the seven fungi investigated, viz., *Alternaria*, *Aspergillus*, *Hormodendron*, *Monilia* [*Candida*] *albicans*, *Mucor*, *Penicillium*, and *Trichoderma* [*R.A.M.*, xvi, p. 317]. Of 80 patients 13 (16 per cent.) reacted positively by intradermal test to one or more of the moulds in strengths of 100 to 1,000 protein units, the responses, however, rarely being marked and often varying on re-testing. The writer's studies show that mould spores may be implicated in the causation of both asthma and hay-fever, but their exact importance in this connexion cannot be estimated in the light of the knowledge at present available.

MANDLIK (G. S.). **A record of rhinosporidial polypi with some observations on the mode of infection.**—*Indian med. Gaz.*, lxxii, 3, pp. 143–146, 1937.

From a study of 48 cases of nasal polypi due to *Rhinosporidium* in the Poona district of India [*R.A.M.*, xvi, p. 462], the writer concludes that infection is localized to contaminated water of wells, tanks, or sections in the course of a river in certain areas divisible into groups; that the fungus is transmitted during the processes of bathing, swimming, or diving; and that the part, if any, played by fish or other

aquatic hosts is uncertain, but that sand and silt probably assist in the conveyance of the organism. The strong affinity for water of the local form of *Rhinosporidium* suggests that it may be a distinct variety of *R. seeberi*.

ERDEN (F.). **Abcès mycosique du poumon par 'Monilia' ('Mycotorula').** [A mycotic abscess of the lung due to *Monilia* (*Mycotorula*).]—*Türk Tib Cemiyetl Mecmuasi*, ii, 9, 8 pp., 4 pl., 1936. [Abs. in *Bull. Inst. Pasteur*, xxxv, 8, p. 388, 1937.]

On the basis of its sugar fermentation reactions, the organism isolated from the sputum of a male patient with a pulmonary abscess was identified as *Mycotorula* (*Monilia*) [*Candida*] *bronchialis* [*R.A.M.*, xv, p. 502], which is believed to have acted in a primary capacity as the agent of the disease.

REDAELLI (P.), CIFERRI (R.), & GIORDANO (A.). **Debaryomyces neoformans (Sanfelice) nobis, n. comb. pour les espèces du groupe Saccharomyces hominis—Cryptococcus neoformans—Torula histolytica.** [*Debaryomyces neoformans* (Sanfelice) *nobis*, n. comb. for the species of the group *Saccharomyces hominis—Cryptococcus neoformans—Torula histolytica.*]—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 1–2, pp. 24–28, 1937.

In confirmation of Todd and Herrmann's recent identification of 10 strains of the organism conmonly known as *Torula histolytica* or *Cryptococcus hominis* as belonging to *Debaryomyces* (*D. hominis*) [*R.A.M.*, xvi, p. 254], the authors state that examination of 19 strains of *T. histolytica*, the original strain of *C. neoformans*, 3 strains of *C. hominis*, and strains of *C. psichrophilicus* and *T. nasalis* showed the epispore of the ascospores to be verruculose, muriculate, or undulating, a fundamental character of *Debaryomyces*. Conjugation was generally isogamous; ascospore formation took place in the zygote, and empty or emptying ascogonia were noted in the final stage of sporulation, which occurred in ordinary media as well as in hanging drop cultures.

The identification by Lodder and Giordano of *Saccharomyces neoformans* with *C. hominis* and *T. histolytica* [ibid., xiv, p. 694] shows that priority of the specific name of these organisms belongs to *neoformans*. The organisms brought together as *Torulopsis neoformans* (Sanfelice) Redaelli 1931 should now be known as *D. neoformans* (Sanfelice) *nobis* n. comb., additional synonyms of which [ibid., xiv, p. 758] are *C. psichrophilicus*, *C. lithogenes*, *C. meningitidis*, *C. gotoi*, and *C. granulomatogenes*.

SCALFI (A.). **Vasti ascessi delle regioni lombo-iliache da 'Aspergillus flavus'.** [Huge abscesses in the lumbar-iliac region induced by *Aspergillus flavus*.]—*Boll. Soc. med.-chir. Pavia*, l, 3, pp. 339–358, 1 fig., 1936.

Full clinical details are given of an exceptional case of multiple abscesses of enormous dimensions in the lumbar-iliac region in an elderly male patient associated with the presence of *Aspergillus flavus* [*R.A.M.*, xv, p. 20]. The fungus originated in a tubercular condition of the lung,

but it was only on migrating to a fresh site that it acquired the specifically pathogenic character described.

Léon-Kindberg (M.), Parat (M.), & Netter (H.). **Tumeur mycosique du poumon (aspérgillose pulmonaire primitive pseudo-cancéreuse).** [A mycotic tumour of the lung (primary pseudo-cancerous pulmonary aspergillosis.)]—*Pr. méd.*, xliv (ii), 92, pp. 1834–1837, 9 figs. (4 col.), 1936.

The fungus associated with a fatal case of primary pulmonary aspergillosis, simulating cancer, in a 41-year-old-man, is tentatively identified as a species of *Aspergillus* allied to *A. bouffardi* Brumpt.

Volferz (Galina). **Causal agents of mycosis among the children of Saratov.**—*Rev. Microbiol., Saratov*, xv, p. 77, 1936. [Abs. in *Bull. Inst. Pasteur*, xxxv, 8, p. 395, 1937.]

Of 1,688 children, aged 1 to 14 years, whose hair, skin, and nails were examined at Saratoff [U.S.S.R.] for the presence of mycoses [*R.A.M.*, ix, p. 313 *et passim*], 45·6 per cent. yielded positive results. Trichophytosis predominated (97·6 per cent. of the total), represented by *Trichophyton violaceum* (67·2 per cent.) [ibid., xvi, p. 459], *T. crateriforme* (14) [ibid., xvi, p. 458], *T. gypseum* 10·8), *T. faviforme* (3·6) [ibid., xiii, p. 701; xv, p. 296], and *T. niveum* (0·4) [ibid., xv, pp. 222, 501], *Achorion schoenleini* being isolated from only 0·8 per cent. of the available material.

Cook (M. D.) & Graham (R.). **Favus (Achorion muris) infection of mice.**—*J. Amer. vet. med. Ass.*, lxxxix, 3, pp. 321–323, 4 figs., 1936.

A fungus isolated from the scalp of a mouse naturally infected with favus was characterized on wort agar by luxuriant, velvety, white colonies and a septate, concatenate mycelium, and was identified by C. W. Dodge as *Achorion quinckeanum* [*R.A.M.*, xiii, pp. 164, 237; xv, p. 501]. It was inoculated into a healthy mouse with positive results.

Bendixen (H. A.). **A study of the churn cleaning methods used by plants producing butter of various yeast and mold counts.**—*J. Dairy Sci.*, xx, 1, pp. 15–25, 1937.

From a study of the methods of churn treatment employed by seven butter-producing plants in the State of Washington, the following factors would appear to be significant in the reduction of the yeast and mould incidence [see next abstract]: (1) the use of ample quantities of wash water (at least $\frac{1}{3}$ to $\frac{1}{2}$ the capacity of the churn); (2) a high temperature (180° to 200° F.) of the water; (3) the use of 0·1 to 0·2 per cent. washing powder solution to remove grease, enhance germicidal capacity, and improve odour; (4) washing or rinsing with an alkaline crystalline hypochlorite solution of about 50 parts per million together with hot-water treatment; (5) keeping the hot water in contact with the revolving churn for at least 15 mins.

Considering individual samples, no direct relationship was found between yeast and mould counts and the quantity and keeping properties of the butter held for one month at 36° to 41°, but when grouping the plants according to their median yeast and mould counts,

the average scores of each group, both for fresh and stored butter, decreased and the average score losses during storage increased parallel with a rise in the yeast and mould incidence.

WILDMAN (J. D.). **Development of methods for the estimation of mold in cream or butter.**—*J. Ass. off. agric. Chem., Wash.*, xx, 1, pp. 93–100, 3 graphs, 1937.

A microscopic method for the estimation of the extent of mould [unspecified] mycelium in butter [*R.A.M.*, xv, pp. 154, 454] and a simple macroscopic means for the detection of similar contamination in cream are described. The procedure for the butter tests is as follows: to 1 gm. of butter 7 c.c. of hot carob bean gum solution (0·75 per cent.) is added and the solution is stirred until well mixed and the fat globules 0·1 to 0·2 mm. in diameter; a portion is then mounted on a mould-counting slide and the incidence of mould estimated by the Howard method (Methods of Analysis, Association of Official Agricultural Chemists, p. 500, 1935), whereby a field is reckoned as positive if the combined length of the two largest fungal filaments exceeds $\frac{1}{6}$ of the diameter of the field. Cream is tested as follows: 5 gm. are weighed out and 15 c.c. of a hot methylene blue-borax solution added (30 gm. sodium borate and 10 methylene blue tablets in 1 l. water); after three minutes' stirring the mixture is filtered through a perforated brass funnel, No. 26 gauge with 625 holes per sq. in., each 0·02 in. in diameter, more solution being added to wash any mould clots into the apex of the funnel. With a dissecting needle the top of the mould is levelled off to form an inverted cone, the diameter of the base of which is measured in mm.

The following are the principal points brought out in the development of the procedures. In the dairies inspected in the eastern and central States infection was generally so well distributed throughout the churn that the data for one sample by the microscopic method were considered to be representative of the whole churning. The majority of the cream samples from individual farmers' lots were relatively free from mould except during the hot summer months and the autumn, when infection from this source increased. The mould mycelium in cream was largely retained in the butter on churning. The methylene blue-borax test made possible the detection of cream samples containing excessive amounts of mould, 97 per cent. of which had abnormal flavours.

VERNON (T. R.). **The mycology of dairy products.**—*Dairy Ind.*, i, 1, pp. 21–22; 2, pp. 56–58; 4, pp. 125–126, 4 figs., 1 graph, 1936; ii, 2, pp. 63–65; 4, pp. 133–135, 6 figs., 1937.

This is a popular account of the writer's investigations on the mycology of dairy products (including butter boxes and parchment wrappings), technical papers on which have been noticed from other sources [*R.A.M.*, xiv, p. 761].

KOTTHOFF (P.). **Neue Topfpflanzkrankheiten.** [New pot plant diseases.] —*Kranke Pflanze*, xiv, 2, pp. 28–30, 2 figs., 1937.

Fusarium moniliforme [*Gibberella moniliformis*] was isolated from

circular, sunken, reddish-brown, yellow-bordered lesions, 1 cm. in diameter, on leaves of *Sansevieria zeylanica* plants in pots, and inoculated into healthy foliage through wounds with positive results. The centres of the spots shrivel and fall out, imparting a shot-hole appearance to the foliage and rendering the plants unmarketable. Control should be based on the removal of diseased material and the repeated treatment of the plants with a copper-containing fungicide, such as 1 per cent. Burgundy mixture or nosperit.

Phytophthora cactorum is the agent of a soft, dark brown to black rot of the stem and branches of *Kalanchoë globulifera* var. *coccinea* extending from the collar upwards to the leaf blades and downwards to the roots and involving the tissues from the cortex to the xylem. In one nursery 25 per cent. of the plants were destroyed by the fungus, which is believed to have been introduced with beech leaf mould, since beech seedlings grown in sand inoculated with the *Kalanchoë* strain of *P. cactorum* rapidly succumbed and presumably the *Phytophthora* on beech commonly referred to *P. fagi* [*R.A.M.*, xiii, p. 605] (regarded by many authors as identical with *P. cactorum*) can pass to *Kalanchoë*. The soil should be sterilized with uspulun or formalin or by heat, and mildly affected plants sprayed with 0·25 per cent. uspulun.

SCHMIDT (H.). **Eine Blattfleckenkrankheit an Pelargonien (Erreger: Macrosporium pelargonii).** [A leaf spot disease of Pelargoniums (causal organism: *Macrosporium pelargonii*).]—*Kranke Pflanze*, xiv, 3, pp. 50–51, 1 fig., 1937.

Zonal pelargoniums [*Pelargonium zonale*] in the Pillnitz [Saxony] Palace Park were destructively attacked in May, 1936, by *Macrosporium pelargonii* [*R.A.M.*, xv, p. 442], the agent of a foliar disease characterized by circular, zonate, brownish lesions, surrounded by a well-marked ridge, and tending to enlarge or become confluent. The Köchlin Black variety was most severely affected, but the pink Souvenir de la Rocque was also involved to a lesser extent. Control measures should include the use of cuttings from healthy mother-plants, change of beds (to guard against the possibility of soil infection), and prophylactic treatment with Bordeaux mixture.

NICOLAS (G.) & AGGÉRY (BERTHE). **Maladies bactériennes du Begonia.** [Bacterial diseases of the Begonia.]—*C.R. Soc. Biol., Paris*, cxxiv, 10, pp. 900–903, 1937.

Begonia gracilis in Toulouse conservatories suffers from two bacterial diseases. One is a systemic disturbance, beginning with a marginal chlorosis and wilting of the foliage which gradually extends inwards to the petiole, involving the shedding of the leaves and the dropping of the flowers before opening in consequence of the desiccation and basal blackening of the peduncle. The newly formed shoots are pale green and the leaves fall rapidly, so that the plants assume a stunted, somewhat bushy appearance.

The second disorder, which may aptly be termed 'smallpox', is of a milder character on *B. gracilis*. Localized sunken, greenish-brown, irregular lesions appear along the leaf margins; sometimes the parenchyma shrivels but the leaves do not fall. The flowers open but are

rapidly shed. *B. semperflorens* is attacked by this disease in a severe form.

The organism responsible for the desiccation of *B. gracilis* occurs singly or in chains of two to five in the form either of very short (0·2 to 0·3 μ) Gram-negative rods or of larger Gram-positive ones (2 to 4 by 1 to 1·5 μ). Gelatine is liquefied by the two forms in association. The 'smallpox' bacterium measures 0·5 μ in length and often occurs in chains of two or three; it is Gram-negative and liquefies and discolours gelatine.

Positive results were given by inoculation experiments on *B. schmidtiana* with cultures of the desiccation disease from *B. gracilis* and with those of 'smallpox' from *B. semperflorens*.

BALDACCI (E.). **Il mal dell' Oidio sopra la Photinia serrulata Lindl.** [*Oidium* disease on *Photinia serrulata* Lindl.]—*Costa azzur. agric.-flor.*, xvii, 2, pp. 29–30, 2 figs., 1937.

In the spring of 1936, *Photinia serrulata* plants at Forlì, Italy, became infected by *Oidium leucoconium* [*Sphaerotheca pannosa*], the attack being confined mainly to the young leaves of the apical shoots. This appears to be the first record of the fungus on this host [cf. *O. photiniae* Jacz. (?*Podosphaera leucotricha*) recorded on *P. serrulata* in Italy by Peglion: *R.C. Accad. Lincei*, xxv, 1, 5, p. 341, 1916].

O'LEARY (K.) & GUTERMAN (C. E. F.). **Penicillium rot of Lily bulbs and its control by calcium hypochlorite.**—*Contr. Boyce Thompson Inst.*, viii, 5, pp. 361–374, 1 fig., 1937.

A tabulated account is given of experiments from 1931 to 1936, inclusive, on the control of the cold storage rot of lily bulbs in the United States caused by a species of *Penicillium* [*R.A.M.*, x, pp. 668, 776; cf. also xiii, p. 381], which appears to belong to Westling's *P. cyclopium* group (*Arkiv Bot.*, xi, pp. 1–156, 1912). The rot develops at temperatures just above the freezing point; it begins as small brown spots on the scales or basal plate of the bulb, which enlarge slowly at low temperatures, and become depressed; the centres are covered with a white mycelial growth which assumes a light dull glaucous blue due to the conidia. The affected area extends to the whole scale and then to the basal plate or adjacent scales. Bulbs exhibiting slight attack on the outer scales usually develop normal plants and are found to be free from the fungus the next autumn, but if the infection occurs in several of the inner scales near the bud, no plant is produced. *Lilium rubellum*, *L. japonicum*, and *L. auratum* are susceptible to the disease, *L. speciosum* less so, and *L. longiflorum* but slightly susceptible. The causal fungus was isolated and its pathogenicity established; it was able to rot bulbs at 3° C., the optimum was 10°, and no rotting occurred at over 28°.

In the experiments described poor or no control was obtained with sulphur dust, copper-lime dust, formaldehyde in liquid and dust form, borax solutions, by the use of plain fruit wrappers or wrappers treated with copper or mercury compounds, or, lastly, by removing the roots from the bulbs before packing. Organic and inorganic mercury dusts, while fairly effective against the rot, were highly toxic to the lilies, and naphthalene flakes discoloured the bulbs. In the 1935–6 tests excellent

control of the rot, without undue injury to the bulbs, was obtained by mixing calcium hypochlorite powder (20 to 27 per cent. available chlorine) with the packing soil at the rate of 160 gm. of powder to 50 lb. of soil; the bulbs were placed in cold storage for four and a half months after shipment from Japan, when 78 per cent. of the treated bulbs were found to be first grade (free from rot), 20 per cent. second grade (with one to five outer scales rotted), and 1 per cent. third rate (with more than five scales rotted). Calcium hypochlorite at the same concentration also controlled the bulb mite (*Rhizoglyphus echinopus*).

Shcherbak [Shtsherbak] (S.). Селекция Подсолнечника на устойчивость к ржавчине. [Breeding the Sunflower for resistance to rust.] —*Bull. appl. Bot. Select., 1937*, Ser. A, 21, pp. 67–76, 2 graphs, 1937.

After briefly indicating the very considerable economic losses caused by the sunflower rust (*Puccinia helianthi*) [*R.A.M.*, xvi, p. 184] in the U.S.S.R. [where sunflower seed is extensively used for the industrial production of oil and also for human consumption], the author gives a concise review of the previous attempts, by selfing resistant individuals or by interspecific crosses, to breed a rust-resistant strain of the plant, all of which have failed hitherto. A new attempt is now being made by inbreeding certain varieties or lines of the sunflower which previous observations had shown to exhibit a degree of field resistance, such as No. 314, Fuchsinka, and Tchernyanka. The results of three years' work, although admittedly preliminary, are encouraging in that the original resistance of the inbred families has been markedly increased in each consecutive generation, as shown, for instance, by the fact that in the F_3 generation of Fuchsinka 10 the intensity of the rust in the greenhouse was reduced by from 36 to 48 per cent. (from 4·5 to 3 to 2·5 by the usual 5 marks scale to measure rust intensity). Inbreeding from individually resistant plants was shown to be impracticable, because of the recessive nature of the factors for resistance.

Berkner (F.). **Thielavia basicola, eine Gefahr für den Leguminosen-Zwischenfruchtbau?** [Does *Thielavia basicola* constitute a menace to leguminous crop rotation?]—*Pflanzenbau*, xiii, 9, pp. 321–334, 12 figs., 3 diags., 1937.

In the course of observations in Silesia on the compatibility of certain legumes in the crop rotation succession, the fourth consecutive stand of yellow lupins (*Lupinus luteus*) was found to be severely attacked in 1936 by *Thielavia* [*Thielaviopsis*] *basicola* [*R.A.M.*, xv, pp. 101, 536]. The plants were extensively wilted and the roots of the older ones rotten and much blackened; secondary infection by *Fusarium* spp. had occurred. *T. basicola* also infected *L. angustifolius*, field peas, and *Vicia villosa*. The conditions stimulating the fungus to such intense parasitic activity, in contrast to its normally saprophytic habit, are unknown, but they may include the absence of decaying organic matter in the soil, which has received no stable manure for at least ten years, and the secretion by the lupin roots of some metabolic product imparting a pathogenic character to the organism. The existence of a physiologic race adapted to legumes, and especially to *L. luteus*, appears to be indicated.

HEY (A.), KLINKOWSKI (M.), & RICHTER (H.). **Der Stengelbrenner (Anthraknose) der Serradella.** [The stem-burner (anthracnose) of Serradella.]—*NachrBl. dtsch. PflSchDienst*, xvii, 3, pp. 23–24, 1 fig., 1937.

Serradella (*Ornithopus sativus*) crops in East Pomerania, Grenzmark, and Neumark were observed in July, 1936, to be suffering from a hitherto unknown disease associated with dark bluish-brown, somewhat sunken lesions partially or entirely girdling the stems, and more or less severe wilting, culminating at an advanced stage in the collapse of the plants above the site of attack. The root-collar, stem base, and basal shoot axes may also be involved, in which case the entire plant rapidly succumbs. Infection was most prevalent (up to 90 per cent. of the stand) in low-lying or overshadowed situations, where the loss of fodder was reckoned at 40 to 70 per cent. In one locality a stand sown in June was almost free from infection, whereas another in the vicinity planted at the normal time in April, was 90 per cent. diseased. *Colletotrichum trifolii*, first observed on lucerne in Germany in 1933 [*R.A.M.*, xiii, p. 382], was isolated from the wilted material and inoculated with positive results into *O. sativus* and *O. compressus*.

FURNEAUX (B. S.) & KENT (W. G.). **'The death': a trouble of fruit trees due to root suffocation.**—*Sci. Hort.* (formerly *H.E.A. Yearb.*), v, pp. 67–77, 2 pl. [facing pp. 52, 53], 2 figs., 1937.

In 1936, large numbers of fruit trees and bushes in south-eastern England collapsed and died as a result of a well-known condition referred to locally as 'the death'. The usual symptoms on fruit trees are that the leaves remain small, turn yellow, and wilt, while the terminal shoots either make no growth or also wilt; collapse rapidly sets in, though a partial recovery may be made. Fruit bushes either die before making any growth, or after producing weak, scorched side growths. In all cases the roots were wholly or partially dead and emitted an alcoholic odour. Two forms of the trouble occurred, i.e., 'regional death' in which blocks of trees and bushes were affected, and 'wind-rocking death' which affected only individual trees. In the former type of trouble the whole root system was dead under a certain level, due to the soil being waterlogged. In 'wind-rocking' death the base of the stem was dead from or just under ground-level, and the main roots had been killed to a distance of 12 to 18 in. outwards from the stem. The swaying of the trees had produced cavities in the soil, and these had become filled with rain, the resultant lack of aeration killing the roots. Hosts susceptible to the condition included apples (to both types), plums, cherries, raspberries, gooseberries, pears, blackberries, and loganberries, 'the wind-rocking' form affecting tree fruit only, except for one case in raspberries.

KIDD (F.) & WEST (C.). **The keeping qualities of Apples in relation to their maturity when gathered.**—*Sci. Hort.* (formerly *H.E.A. Yearb.*), v, pp. 78–86, 8 graphs, 1937.

In this general account of their studies on the storage behaviour of Bramley's Seedling apples [cf. *R.A.M.*, xvi, p. 185] picked at different times between mid-September and mid-October the authors found that

the more mature the fruit when placed in cold or gas storage the more rapidly do fungal wastage, breakdown, and scald of the senescent type develop. The earlier apples are gathered, however, the more liable are they to develop superficial scald and the longer apples are kept at ordinary temperatures before being placed in cold storage the less susceptible they become to this disorder [ibid., xvi, p. 233]. Fruit placed in cold storage after the climacteric did not develop scald, which, except with very susceptible varieties, such as Newton Wonder and Annie Elizabeth, can usually be controlled by oiled wrappers [ibid., xvi, p. 260]. The volatile substances responsible for superficial scald may be liberated months before the trouble becomes visible, and the wrappers effect control chiefly during this period. Clear evidence was recently obtained that apple tissues break down most rapidly when the fruit is put into cold storage at the peak of the climacteric. Though bitter pit [ibid., xvi, p. 325] in the case of Australian and New Zealand apples is much more serious on immature fruit than fruit picked later in the season, experiments with several English apple varieties indicated that the maturity of the fruit when gathered has little or no effect on the development of the condition in cold or ordinary storage.

From a consideration of all the factors discussed in this article the authors conclude that apples should be gathered during the fortnight just before the beginning of the climacteric.

WINKELMANN (A.). **Spritztermine für die Fusikladium Bekämpfung.** [Spraying schedules for *Fusicladium* control.]—*NachrBl. dtsch. PflSchDienst*, xvii, 2, pp. 9–13, 3 graphs, 1937.

Three years' spraying experiments (1934 to 1936) in the Lower Elbe district of Germany showed that apple scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xvi, p. 470 and next abstract] may be effectively combated by three applications of a copper-containing preparation, the first being given as soon as the ascospores on the leaves reach maturity, provided rain is expected during the next few days and the trees have attained the critical stage of development for infection (end of March under local conditions during the period of the tests), the second about 20th, and the third from 25th to 30th April; in 1934 a fourth treatment on 10th May would have been desirable. Further applications should be unnecessary if the spread of the ascospores has been properly checked, but a re-examination of the leaves by Holz's method [ibid., xv, p. 661] from time to time is advisable to guard against accidents which might permit the extension of the disease through the conidia.

The results obtained by Osterwalder in Switzerland with his 'blue spray' (4 to 6 per cent. Bordeaux mixture applied to dormant trees) [ibid., xvi, p. 388] are briefly discussed and considered to fall short of German requirements.

LOEWEL (E. L.). **Der Erfolg der Schweizer und der Altländer Spritzfolge gegen Fusikladium. Dreimalige oder sechsmalige Spritzung gegen Fusikladium.** [The result of the Swiss and Altland spray schedules against *Fusicladium*. Three or six applications against *Fusicladium*.]—*Obst- u. Gemüseb.*, lxxxiii, 3, pp. 36–37, 1937.

Experiments were carried out in north Germany in 1936 to determine

the efficacy under local conditions of Osterwalder's 'blue' spraying schedule against apple scab (*Fusicladium*) [*Venturia inaequalis*: see preceding abstract] in comparison with that normally followed in the Altland. The following treatments were given: 1 ('blue' schedule), 5 per cent. veralin (carbolineum) on 10th March, 6 per cent. Bordeaux on 24th, and 1 per cent. sulfo (double-strength lime-sulphur) on 25th May, with a supplementary application (to late-ripening varieties only) of 1 per cent. sulfo on 17th August; 2 (Altland schedule), carbolineum at the end of February, 2 per cent. copper-lime at the time prescribed for the Swiss 'blue' spray, 1 per cent. of a copper-arsenic compound shortly before flowering, 2 per cent, lime-sulphur plus 1 per cent. lead arsenate paste shortly after flowering and again a fortnight later, and 0·25 per cent. copper-lime at the beginning of August. Fairly good results (by Swiss standards) were obtained with the 'blue' schedule on early varieties, but the protection afforded to late apples, such as Boiken (only 6·4 per cent. healthy), Orleans Reinette (4·6 per cent.), and London Pippin (23·1 per cent.), was totally inadequate; 76·3 per cent. of the Boikens treated by the Altland schedule were entirely scab-free.

HAMILTON (J. M.). **Recent investigations on the control of Cedar-Apple rust in the Hudson Valley.**—*Bull. N.Y. St. agric. Exp. Sta.* 678, 34 pp., 8 figs., 1937.

After briefly reviewing the life histories of *Gymnosporangium juniperi-virginianae* [*R.A.M.*, xvi, p. 190], *G. globosum* [loc. cit.], and *G. clavipes* [loc. cit.] and discussing their relative importance in the cedar-apple rust problem in the Hudson Valley, the author states that the danger from apple foliage infection by *G. juniperi-virginianae* extends locally from 1st May to the latter part of June, the period for apple fruit infection by the same fungus being mostly confined to May.

In comparative field spraying tests against *G. juniperi-virginianae* perfect control was obtained only when the applications immediately preceded the wetting periods that induced the infection. Both lime-sulphur and Bordeaux mixture effectively prevent rust infection but are liable to cause injury. In the experiments recorded consistently good results were given by Camden flotation sulphur paste (6 or 8 in 100 and even 3 in 100 in one test) (containing 35 per cent. sulphur with iron-oxide added; Camden Coke Plant, Camden, N.Y.) and kolofog (6 in 100); Koppers flotation sulphur paste (6 in 100) gave results as good as the Camden paste in one experiment but was slightly less effective in another. Koppers dry-wettable flotation sulphur (5 in 100) gave good control under average conditions, but was less satisfactory in serious outbreaks; it was improved by the addition of orthol-K Ready-mix oil which increased the adhesiveness. Mulsoid sulphur (6 in 100) (a crude ground sulphur manufactured by Sherwin Williams Co., Cleveland, Ohio) varied widely in efficacy, and magnetic spray (6 in 100) (a wettable sulphur prepared by National Sulphur Co., New York) was as effective as Koppers dry-wettable sulphur in the less severe tests. Mike sulphur (3 and 5 in 100) (a wettable sulphur of the Dow Chemical Co., Midland, Mich.) gave excellent control in a single test with orthol-K Ready Mix oil added. Bordeaux mixture

(2–3–100) was effective, but not coposil (2–3–100) or ZO (1–1½–100) [see below, p. 544]. Prompt and thorough spraying appeared to be more important than the strength of the materials used.

Suggestions are made for adapting the data obtained to commercial practice and combining the rust sprays with the usual programme against scab [*Venturia inaequalis*], e.g., by spraying against rust between the early petal-fall scab spray and the 10-day spray, and again between the last-named and the codling moth [*Cydia pomonella*] spray. If proper spraying equipment is unavailable and the eradication of *Juniperus virginiana* impracticable, susceptible apple varieties should be replaced by resistant ones such as Milton, McIntosh, and Cortland.

DIACHUN (S.). **Some effects of the environment on the spongy dry rot of Apples.**—*Phytopathology*, xxvii, 2, pp. 203–206, 1937.

A close similarity has been observed to exist between the common black rot of apple (*Sphaeropsis malorum* Peck) [*Physalospora mutila: R.A.M.*, xv, p. 726] and the spongy dry rot (*Volutella fructi* Stev. & Hall = *Colletotrichum fructus* [(Stev. & Hall) Sacc.] sensu M[aud] M. Duke) [ibid., viii, p. 268] under conditions of low relative humidity (40 per cent.) preventing the formation by the latter fungus of setose acervuli. In greenhouse inoculation experiments with aqueous suspensions of *C. fructus* on Grimes Golden, Willow Twig, and Jonathan fruits, and on twigs and leaves of the first-named variety, a high degree of atmospheric humidity was found to be requisite for the production of acervuli on the fruits and the development of foliar symptoms not previously reported in nature. The leaves appear to be penetrated directly through the epidermal layer. Spongy dry rot is stated to be prevalent in widely scattered regions of the United States, and may cause considerable damage under favourable conditions.

BORZINI (G.). **Il 'mal del piombo' del Pero in Italia.** [Silver leaf disease of Pear in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 4, pp. 217–224, 1 pl., 5 figs., 1 plan, 1936. [Received May, 1937.]

During 1936 pear trees in various parts of Lombardy showed symptoms of silver leaf disease accompanied by unproductivity, and frequently by chlorosis, wilting, and rolling of the leaves. The disease is regarded as the same as that recently reported by Goidànich [*R.A.M.*, xv, p. 446] and the development of sporophores at the collar of severely diseased plants enabled the fungus involved to be identified as *Stereum purpureum*. The condition appeared to be of a serious nature only in one locality periodically subject to waterlogging. The Passa Crassana variety was the most susceptible and Duchessa d'Angoulême highly resistant or immune, while Bergamotta Espérèn and Butirra Clairgeau have so far remained unaffected. Further investigations are in progress.

HUTCHINS (L. M.), BODINE (E. W.), & THORNBERRY (H. H.). **Peach mosaic, its identification and control.**—*Circ. U.S. Dep. Agric.* 427, 48 pp., 31 figs., 1 graph, 1937.

This is a summary of the available knowledge of peach mosaic

[*R.A.M.*, xvi, p. 329], now known to occur in Texas, Colorado, California, Utah, New Mexico, and Arizona. The manifestations of the disease differ with the variety affected, one or more of the following symptoms affording clues of identification: 'breaking' of flowers (conspicuous in Carman, Chilow, and Early Wheeler), retarded spring leafage, variously mottled and deformed foliage, twig abnormalities, and fruit malformation. The incubation period of the disease following grafting is also variable, but spring inoculations are likely to result in the appearance of symptoms during the same growing season. Symptoms resembling those of peach mosaic have occasionally been observed on almonds, apricots, cherries, and plums [see above, p. 518] growing in the vicinity of peach orchards. The virus is not communicated from diseased to healthy trees by irrigation water, pruning implements, or other mechanical contacts, through the soil, or (in preliminary tests) by pollination with viable pollen, yet under favourable conditions its contagiousness is so great that the commercial value of an entire planting may be destroyed in three to six years. Vigorous eradication measures are proving effective in Colorado.

Cation (D.) & Rasmussen (E. J.). **Comparisons of some old and new materials for spraying Cherries.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xix, 3, pp. 123–142, 9 figs., 1937.

In comparative spraying tests carried out by D. Cation in Michigan from 1934 to 1936, inclusive, for the control of cherry leaf spot (*Coccomyces hiemalis*) [*R.A.M.*, xv, p. 2] under conditions favourable to disease development, red copper oxide containing 86 per cent. copper (½ to 2 in 100); cupro K, a compound of copper oxychloride containing 25 per cent. copper (4 to 6 in 100); ZO, a copper zeolite compound containing 25 per cent. copper (4 and 5 in 100); Oxo-Bordeaux [ibid., xiii, pp. 267, 358] containing 12½ per cent. copper (6 and 8 in 100); and Bordeaux mixture (4–6–100 and 6–8–100) all gave good control, though high calcium Bordeaux mixture and red copper oxide were excessively injurious. Cupro K, ZO, and Oxo-Bordeaux (especially the first) gave markedly better control than lime-sulphur (1 in 40) when long periods elapsed between the applications or when few applications were made. The copper sprays showed a tendency to kill the fungus in established infections without causing defoliation. Infected leaves sprayed with lime-sulphur turned yellow in a few days and fell.

Experiments by the second author on the influence of fungicides on cherry trees and fruits in an orchard comparatively free from leaf-spot infection showed that trees given thorough applications of lime-sulphur at the correct times retained their foliage better, gave larger yields and larger fruit and showed a greater increase in trunk circumference and shoot growth than trees sprayed with high calcium-lime Bordeaux mixture, of which the 4–8–100 formula gave the least defoliation. Trees sprayed with Cupro K, ZO, and Oxo-Bordeaux gave comparable yields of comparably sized fruit with trees sprayed with lime-sulphur, but finally showed greater defoliation. Growers who obtain good leaf-spot control with lime-sulphur should continue with this spray. The new copper compounds are promising enough for limited trial, but only if applied with care.

LÖHNIS (MARIE P.). **Ziekteverschijnselen bij Aalbessen veroorzaakt door de minerale voeding.** [Pathological symptoms in Red Currants induced by mineral nutrition.]—*Tijdschr. PlZiekt.*, xliii, 2, pp. 33–58, 4 pl., 10 figs., 1937. [English summary.]

It was ascertained in the course of pot and field experiments on mineral nutrition in relation to pathological conditions of red currants that a characteristic rusty- to purplish- or greyish-brown discoloration of the leaves may be induced by chlorine ions (0·005 to 0·03 N), sodium chloride being more injurious in this respect than potassium or calcium chloride. It was further observed that potassium deficiency may result in the development of sharply delimited, dark purple lesions scattered over the leaves, as well as in the familiar marginal scorching [*R.A.M.*, xiii, p. 173]. Boron deficiency caused a brown discoloration, shrivelling, and blackening of the petiole of the youngest leaflet, while the neighbouring leaves were edged with a wide, dry, light brown band, leaving only a narrow central zone green. This condition was not observed in the open. At concentrations of 0·02 and 0·03 N sodium and potassium sulphate, and in a few instances nitrate, induced in pot tests only a reddish-purple to reddish-brown marginal discoloration, accompanied by curling of the edges and the development of alternating zones of discoloured and green foliar tissue.

ADAMS (J. F.). **Report of the Plant Pathologist for 1936.**—*Bull. Del. Bd Agric.*, xxvii, 1, pp. 3–15, 1937.

In this report, which is on the same lines as those for previous years [*R.A.M.*, xiv, p. 496], it is stated that during the spring of 1936 many plantings of Blakemore strawberries in Delaware showed yellowing, the incidence ranging from a trace up to 90 per cent. Many of the plantings recovered completely, though severely affected plants made very little growth and set few or no fruits. The condition appears to have been due to some weakness in propagating ability peculiar to the variety.

STAHEL (G.). **Banana leaf spot (Cercospora musae).**—*Trop. Agriculture, Trin.*, xiv, 3, pp. 59–60, 1937.

A preliminary resumé is given of the results obtained in a comprehensive investigation into banana leaf spot (*Cercospora musae*) [*R.A.M.*, xiv, p. 45; xvi, p. 156] in the West Indies and Surinam where the disease has since 1933 and 1934, respectively, become increasingly prevalent, and is causing serious losses. The fungus penetrates the lower surface of the leaf, inoculations on the upper surface giving at most only insignificant infection. Only the two youngest leaves are highly susceptible, though generally free from spots; on leaves older than the third even a concentrated emulsion of the conidia produced only weak, if any, infection. The germ-tube passes the first four to six days on the leaf surface, enters a stoma, and progresses along the inside surface of the large air chamber to the palisade tissue, where the hypha branches and grows intercellularly between the palisade cells. This mycelium remains, however, sparse. Spread then takes place to the neighbouring air chambers up to the veins, and the palisade tissue turns

yellow-green. Penetration of the veins is difficult, and the mature streaks often consist of one internerval space, though in other cases the streak is accompanied by one or two shorter streaks along the sides.

The first symptoms (minute yellow-green speckles the size of an air-chamber) appear 15 to 17 days after inoculation (11 days after penetration of the stomata). A week later the speckles have lengthened out into streaks 8 to 10 mm. long, and appear to be covered by rust; the fungus grows out through the stomata in the streak and spreads for 2 or 3 mm. round it, chiefly on the lower surface of the leaf. Two or three days later a toxic effect is produced on the tissue under the mycelium, causing guttation and infiltration, followed in a few hours by necrosis. The fungus then at once enters the dead tissue from the outside through the stomata and produces acervuli in the substomatal air chambers on both sides of the leaf. The spot may enlarge until the process becomes arrested by a margin of tissue impregnated with gum. After a week or longer the spots collapse, and in them only the acervuli on the upper side of the leaf continue to produce conidia. Between the acervuli a *Leptosphaeria* [ibid., xii, p. 458] with its *Hendersonia* stage is regularly present, the dry centres also always showing minute perithecia of a *Mycosphaerella* [ibid., xv, p. 164] and spermogonia shown to belong to *Cercospora*, which is probably the imperfect stage of the *Mycosphaerella*.

In Surinam (where two or three applications of Bordeaux mixture each year since 1934 have been given with good results) outbreaks occur in February and July, each resulting from infection accumulated four or five weeks before. The lower surface of the first two or three leaves should therefore be sprayed in December or January and May or June. In badly infected fields the older spotted leaves should be stripped off, and the spraying repeated after 15 to 20 days.

SALGUES (R.). **Affections parasitaires des Olives et modifications physico-chimiques de l'huile extraite.** [Parasitic diseases of Olives and physico-chemical modifications of the extracted oil.]—*C.R. Soc. Biol., Paris*, cxxiv, 9, pp. 817–819, 1937.

Macrophoma dalmatica, the agent of a light brown, circular, crateriform, relatively inconspicuous spotting of olives in the south of France, Spain, Italy, Austria, [and Cyprus: *R.A.M.*, xiv, p. 83] has been observed on several French varieties, including Pigale, Olivière, Amellau, Moirale, and Caillet, the writer's studies at Brignoles (Var) being mainly concerned with the last-named. The disease has been shown to result not only in a diminution of 3·18 per cent. in the oil content but also in an undesirable dryness of the extract as compared with that obtained from healthy fruits.

FERRARIS (T.). **La lotta contro le malattie dell' Olivo.** [The control of Olive diseases.]—*Riv. agric., Roma*, xxxiii, 752, p. 91, 1937.

Olives in Italy are liable to attack by numerous diseases, including *Bacillus* [*Pseudomonas*] *savastanoi* [*R.A.M.*, xiv, p. 706], *Stictis panizzei* [ibid., iii, p. 348; iv, p. 358], *Cycloconium oleaginum* [ibid., xiv, p. 706], *Cylindrosporium oliviae*, *Fomes fulvus* [ibid., vii, p. 12], *Antennaria elaeophila* [*Capnodium elaeophilum*: ibid., vii, p. 187], and

Sphaeropsis dalmatica [ibid., xv, p. 774]. For the combined control of diseases and insect pests the author recommends a dormant application of a mixture of 3 kg. copper sulphate, 2 kg. iron sulphate, 5 kg. slaked lime, and 1·5 kg. each of carbolineum and sodium hydrate per 100 l. water, followed by other applications when the shoots are young, after flowering, and just before fruit ripening of a mixture of 0·5 kg. copper sulphate, 0·5 kg. ferrous sulphate, 1 kg. slaked lime, 1·5 kg. potassium soft soap, and 0·2 kg. nicotine sulphate per 100 l. water.

BALLOU (F. H.). **Stationary equipment for orchard spraying and the manufacture of home-made liquid lime-sulphur.**—*Bull. Ohio agric. Expt Sta.* 572, 26 pp., 7 figs., 1936. [Received May, 1937.]

After discussing the advantages and disadvantages of stationary spraying for orchards [*R.A.M.*, xvi, p. 389], the author gives a full description of a powerful spraying unit set up in a hilly district of central Ohio in 1929. Water is utilized from a neighbouring spring, from the roof drainage of buildings in the vicinity, and in the dry season, from a large pond. The power pump used has a capacity of 20 galls. per minute at a pressure of 500 lb. Three lines of hose are employed, requiring three men, and ample pressure is provided for all three lines, even on high hilltops a quarter of a mile away, a satisfactory overflow of solution through the pressure relief valve back into the spray tank (1,000 galls. capacity) being maintained. The tank is divided into two equal compartments, spraying being carried out from one while the other is being filled. The main pipe line is $1\frac{1}{4}$ in. in diameter and about 2,000 ft. long, the lateral pipes being $\frac{3}{4}$ in. in diameter, and 175 to 200 ft. (five tree rows) apart. All valves are of the gate type and quickly attachable hose connexions are fitted to the side openings of the T pipe couplings at intervals of 100 to 120 ft., so that by using 100 ft. lengths of spray hose all the trees in a 20-tree block can easily be reached. Instructions are given for the care of the pipe system and putting the machinery into operation, and the paper concludes with full directions for the preparation of home-made liquid lime-sulphur.

TURNBULL (J.). **Fruit tree spraying in 1936.**—*J. Minist. Agric.*, xliii, 12, pp. 1145–1157, 1937.

Analysis of the cost of apple spraying with the latest apparatus showed that including spray mixture, labour, and plant it amounted (per acre) to £6 5*s.* 2*d.*, for average-sized bush trees, using a central plant; £5 18*s.* 8*d.*, for average half standard, using a portable plant; and £8 13*s.* 3*d.*, for very large trees, using a central plant and a heavy programme. In a preliminary test with a new American mobile outfit (from which two men spray while riding on the machine) the figure was only £4 7*s.* 5*d.*, owing to the small amount of wash used. The capital cost per acre amounts to about £12 for a central plant with underground pipes [cf. preceding abstract], and £6 to £8 for the portable and American systems, the latter figure not including the cost of laying on water (often about £2 per acre) or that of the tractor required by the American machine. While the mobile system is excellent in young plantations where the trees are widely separated, and in old ones where they are very tall, in profitable orchards and plantations of bearing

trees the extra expense involved in laying down underground pipes is more than compensated for by the great simplicity of working [cf. *R.A.M.*, xv, p. 380]. Exact figures for the American system, the chief drawback to which is the time wasted in filling, are not yet available.

Vergleichsprüfung von Karrenspritzen für Schädlingsbekämpfung. [A comparative trial of truck sprayers for pest control.]—*Masch. u. Geräteprüf. Reichsnährstandes* (Suppl. to *Tech. in d. Landw.*), ii, 3, pp. 13–20, 5 figs., 16 diags., 4 graphs, 1937.

Full technical details are given of the construction and application of four spraying appliances awarded the silver medal (first prize) of the Reich Food Board at Frankfurt-am-Main in 1936 [cf. *R.A.M.*, xvi, p. 265], viz., 'Suevia' (Gebr. Holder, Metzingen, Württemberg, price R.M. 85 as a mounted pump, 164.25 as a two-wheeled truck), 'Alemannia' (C. Platz, Ludwigshafen, Rhein, R.M. 95 and 160.50, respectively), 'Maxim 2' (Bucher & Guyer, Griessen in Baden, both R.M. 106.50), and 'Rex' (F. Burr, Maschinenbau Degernau, now under the management of F. F. A. Schulze, Berlin, available as a mounted pump only, R.M. 48).

Gebers (A.). **Ein selbstgebauter Erddämpfungskessel.** [A home-constructed soil-steaming kettle.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 11, p. 116, 1 fig., 1937.

For soil sterilization on a small scale by steaming [*R.A.M.*, xvi, p. 124] the writer uses a large washing-copper, into which a sheet of iron is inserted in such a way as to accommodate some 25 l. water below and about 150 l. soil above it. When the copper is heated the water evaporates through the soil, the process of sterilization being complete when a potato placed in the soil becomes soft.

v. d. Muyzenberg (E. W. B.) & Roghair van Rijn (J. J. F.). **De grondontsmetting door middel van electriciteit.** [Soil disinfection by means of electricity.]—*Meded. Land Hoogesch. Wageningen*, xl, 4, 75 pp., 3 pl., 10 graphs, 1936. [English summary. Received April, 1937.]

This is a comprehensive, tabulated account, amplified by citations from the relevant contemporary literature, of the writer's experiments in the application under Dutch conditions of certain American methods of soil pasteurization by means of electricity [*R.A.M.*, xvi, p. 204]. In experiments on the factors affecting conductivity it was found that conductivity increased proportionally to the moisture content with slight deviation when this is low. When the water content of the soil is about 10 per cent., the strength of the current may be increased by the addition of fertilizers, such as ammonium nitrate or potassium sulphate. The relation between temperature and conductivity of the soil is expressed by the formula $I_t/I_{100} = \beta(100\text{-}t)$, in which $\beta = 0{\cdot}0073$, t = temperature in °C., and I = strength of the current in ampères. Experimental data indicated that from 0·06 to 0·15 kilowatt hours of electricity are consumed per cu. dcm. of soil raising the temperature from between 4° and 24° up to 100° depending upon moisture content,

maximum strength of the current, initial temperature, and the like. This method of sterilization is specially recommended for the treatment of small quantities of soil.

MARSH (R. W.). **Some American work on the copper fungicides.**—*Sci. Hort.* (formerly *H.E.A. Yearb.*), v, pp. 60–66, 1937.

From a review of recent modifications of, and substitutes for, Bordeaux mixture [*R.A.M.*, xvi, p. 332] and the use of cuprous oxide [ibid., xv, p. 551 and above, p. 544] as a seed dressing the author concludes that in the absence of blight [*Phytophthora infestans*] potatoes sprayed with Bordeaux mixture give the highest yields when the successive applications contain decreasing amounts of copper. For this crop the lime content of the mixture should not be more than half the copper sulphate content. Copper phosphate and copper ammonium silicate (coposil) [ibid., xvi, p. 477] give promise as fungicides on apples, but may cause injury. On tomato, rose, and hop leaves and flowers cuprous oxide is less injurious than Bordeaux mixture. Cuprous oxide powder as a seed dressing shows marked possibilities for the control of damping-off [*Pythium de Baryanum* and other fungi] and seedling rots. A bibliography of 35 titles is appended.

LA RUE (C. D.). **The use of bromine in the sterilization of fruits and seeds.**—*Science*, N.S., lxxxv, 2204, p. 319, 1937.

In raising sterile seedlings highly satisfactory results were obtained by disinfecting the seed with bromine water diluted 1 in 10, the liquid being poured over the seeds in a container, which was then tightly stoppered. Oats were injured by exposures of over half-an-hour, but maize, cabbage, radish, and sunflower withstood over one hour's immersion. Fruits, from which embryos were later removed for culture purposes, were similarly treated with success, the method considerably increasing the likelihood of obtaining sterile embryos. Immature ovules from tomato were treated for half an hour without ill effect to the young embryos. Fragments of stems and roots, similarly treated, were grown in sterile culture, as were even leaves and flower buds. No rinsing is required after treatment, the structures being placed on sterile filter paper, in liquid, or on agar.

CHEW (A. P.). **Science serving agriculture.**—44 pp., 23 figs., U.S. Dep. Agric., 1936.

In this manual, prepared in 1933, and slightly revised and reissued for distribution at the California Pacific International Exposition in 1936, the writer selects some telling instances of the application of modern scientific principles to practical agriculture, including a number of phytopathological interest. Among these may be cited the control of sugar-cane mosaic in Louisiana [*R.A.M.*, xvi, p. 276], chiefly by means of resistant varieties, the introduction of which restored the yield from less than 50,000 to more than 200,000 tons per annum.

Important progress has been made in the development of sugar-beets resistant to curly top [ibid., xvi, p. 433] and of lettuce varieties capable of withstanding the ravages of brown blight [ibid., viii, p. 286]. In

connexion with the latter it is stated that I. C. Jagger's Imperial Nos. 2, 3, and 6 (strains of New York), while practically immune from brown blight, are highly susceptible to mildew [*Bremia lactucae*: ibid., xiv, p. 683], and it was therefore necessary to breed some so-called 'double resistant' types. This was effected by crossing the mildew-susceptible New York with the highly resistant French Cos or Romaine varieties, and by crossing selections of the resultant progeny with brown blight-resistant Imperial 2 and 3, leading ultimately to the development of the 'double-resistant' Imperial C, D, and F.

HANSFORD (C. G.). **Annotated host list of Uganda parasitic fungi and plant diseases.—Part I.**—*E. Afr. agric. J.*, ii, 5, pp. 419–424, 1937.

This first instalment of the author's list of parasitic fungi and plant diseases so far recorded in Uganda covers hosts belonging to 29 families. Many new fungal species are listed, for which Latin diagnoses are promised shortly. Notes are added on pathological aspects of the more important fungi.

TERRY (M. C.). **To keep culture-media from drying-out.**—*Science*, N.S., lxxxv, 2204, pp. 319–320, 1937.

The author has found 'parafilm' (made by the Marathon Paper Mills Co., Rothschild, Wisconsin) very useful for sealing culture tubes and Petri dishes to prevent the media drying out. It has the advantage over wax of being readily stripped off. Poured plates sealed in this manner are stacked in storage with waxed paper between to prevent sticking.

RYZHKOV [RYJKOFF] (V. L.). Иммунитет растений к болезням, вызываемым фильтрующимся вирусом. [Immunity of plants from diseases caused by filterable viruses.]—*Bull. appl. Bot. Select.*, *1937*, Ser. II, 11, pp. 81–105, 1937. [English summary.]

In this survey the author gives a list of the more important and best studied plant viruses with the reactions of 24 host plants to them, and then briefly reviews the work done in the investigation of inter- and intraspecific immunity of various plants from the viruses, the resistance of individual plants within species or varieties, and acquired immunity. A bibliography of 70 titles is appended.

PUTNAM (D. F.). **Comparative studies in Potato virus diseases.**—*Canad. J. Res.*, xv, 3, pp. 87–107, 3 pl., 1937.

Inspection of President potatoes grown in Nova Scotia by the Canadian Potato Certification service showed the presence in a mild and severe form of a hitherto undescribed mosaic disease, termed 'yellow mottle'.

Comparative studies between common mottle virus, the ring spot virus (seldom found pure in potatoes), and yellow mottle (apparently often uncontaminated in President potatoes) showed that the three viruses belong to the same group. They were all able to infect *Datura stramonium*, were not transmissible by *Myzus persicae*, and were equally resistant to inactivation by various chemicals, while as regards longevity the yellow mottle virus retained its infectivity *in vitro* for over two

months, in this respect comparing favourably with the other two. The rate of movement of the yellow mottle virus through tomato tissues was less than that for ring spot but greater than that for mottle. The higher thermal death point of yellow mottle (73° C. for 10 minutes) separated it from mottle (70°) and ring spot (68°); it was still infective after heating to 72°, and caused no symptoms in *D. stramonium* attributable to admixture with other strains. Evidence was obtained that mottle and yellow mottle may occur together on the same plant.

Brief descriptions are given of the viruses themselves and their symptoms on eight different hosts. Yellow mottle is stated to be easily transmissible mechanically by plant extract and grafting, readily filterable through Mandler N and Berkfeld W candles, filterable with difficulty through Seitz E K size 3 disks, and best characterized in symptoms by its strikingly yellow mottling on tomato, in which there are bright yellow interveinal areas and very dark green bands of tissue along the veins.

The data obtained conclusively demonstrated that a single virus entity causes, unassisted, a specific mosaic disease of President potatoes. All three viruses infected the same hosts and no host plant was found to retain any one exclusively; they could be separated from veinbanding by passage through *D. stramonium,* and in combination with other viruses such as the veinbanding virus or tobacco virus 1 they caused similar symptoms on a number of hosts, e.g., spot necrosis on *Nicotiana alata* and streak on tomato. The author's yellow mottle virus of President potato mosaic is therefore regarded as a further member of the 'latent' or 'X-virus' group.

WHITEHEAD (T.). **The virus problem in relation to seed Potato production in North Wales.**—*Sci. Hort.* (formerly *H.E.A. Yearb.*), v, pp. 39–46, 1937.

The scheme begun in 1927 in North Wales for the production of high quality potato seed tubers [*R.A.M.*, xiii, p. 236] has proved highly successful and has been much expanded, some 70 growers now producing upwards of 250 tons of 'seed' per annum. The great majority of the farms have under 1 per cent. disease. The great success met with is partly due to the pastoral character of the country, which has facilitated the isolation and inspection of the small acreages of potatoes grown on each farm.

Work by W. M. Davies showed that *Myzus persicae* winters in a wingless form on species of *Brassica,* and this to some extent explains why the farms situated in the east of Wales have been less successful than those on the coast, since in the eastern market-garden areas many insects reach the potato crops from the *Brassicae* and would be likely to contract infection from diseased potatoes. There was no evidence that species of *Brassica* themselves act as sources of disease. The infection of a potato crop by virus diseases depends chiefly on the number of diseased plants in the vicinity, and the rate of subsequent movement of the insects in the crop. Even the wingless forms move about with ease, and account for much transmission. That aphids take to flight only in a dry, still atmosphere is a further reason why the farms in the humid, windy coastal regions of Anglesey and south Carnarvonshire

are the most successful in raising disease-free potatoes. It was also found that the time of the first migration to potatoes and the rate of breeding differ with the species, and that the aphid responsible for most of the spread of potato virus disease [*M. persicae*] reaches its maximum infestation on potatoes later in the west than in the east of Wales, and occurs when the crop is ripening off.

By the Seeds (Amendment) Regulations of 1935, the Welsh certified seed can now be sold as Class I (Welsh special stocks), grown under a scheme approved by the Ministry of Agriculture. Such seed must be raised in a district known to permit only minimal spread of virus diseases from a crop showing less than 3 per cent. of virus disease, and the grower is prohibited from planting on his own land any seed from a crop showing more than 1 per cent. visible virus disease.

Beaucarnot (R.). **Rendements et résistance à la dégénérescence de quelques variétés de Pommes de terre.** [Yields and resistance to degeneration of some Potato varieties.]—*Agric. prat., Paris*, N.S., ci, 13, pp. 429–430, 1937.

Continuing his studies on productivity and reaction to 'degeneration' in a number of potato varieties resistant to wart disease [*Synchytrium endobioticum*] [*R.A.M.*, xv, p. 822], the writer obtained satisfactory results with two of Dutch origin, Bevelander and Alpha, which combined prolific yields (103 and 32 per cent., respectively, in excess of those given by the standard local variety, Institut de Beauvais), with a low incidence of disease (0 and 2 per cent., respectively). Arran Banner and Kerr's Pink, the former a heavy yielder and approximating in general type to Institut de Beauvais, also merit further consideration.

Dumon (A.) & Manil (P.). **L'influence des conditions de milieu sur la valeur culturale des plants de Pommes de terre, et notamment sur leur état sanitaire, d'après les travaux récents.** [The influence of environmental conditions on the cultural value of seed Potatoes, especially in respect of their state of health, in the light of recent studies.]—*Bull. Inst. agron. Gembloux*, vi, 1, pp. 33–52, 3 graphs, 1937. [Flemish, German, and English summaries.]

Most of the work here summarized on the influence of environmental conditions on potato degeneration (in relation to virus diseases) in Europe [*R.A.M.*, xvi, p. 486] has been noticed in this *Review* from the original sources.

Botjes (J. G. O.). **De oorzaak van het optreden van dwergmozaiek-zieke Aardappelplanten (stekelkoppen).** [The cause of the occurrence of dwarf mosaic-diseased Potato plants ('spring heads').]—*Tijdschr. PlZiekt.*, xliii, 3, pp. 60–63, 1 col. pl., 1937. [English summary.]

During the last 15 years Eigenheimer potatoes at Oostwold have been observed to suffer both from ordinary and mild mosaic [*R.A.M.*, xvi, p. 487], and grafting experiments showed that plants affected by the latter disease also contain the stipple streak (acropetal necrosis)

virus [ibid., xvi, p. 402] in a masked form. In the course of annual field counts of mosaic plants, certain individuals presenting distinctly atypical symptoms have consistently been noticed. Such plants are conspicuous by their stunted, dwarfed stature and by the clustering of the undulating leaves, especially near the tops of the abnormally short stems. Among farmers in north-east Holland the disorder, which has long been prevalent, is known as 'spring heads', and there seems to be little doubt that it is identical with curly dwarf [ibid., xvi, p. 270] and 'bukett' disease [ibid., viii, p. 593; x, p. 264]. Tubers from dwarfed plants gave rise to progeny of a similar growth habit, while those from mosaic plants yielded a predominantly mosaic stand with a sprinkling of dwarfed individuals. It was conclusively shown by grafting experiments that curly dwarf arises from a combination of the viruses of ordinary mosaic and stipple streak, the absence of mild mosaic as a component being clear from the success of tests with Pale Red Star, which harbours stipple streak but not mild mosaic.

Kameraz (A. J.) & Anikieff (A. M.). Исследование депрессии Картофеля по методу Беххольда и Эрбе. [Investigation of degeneration in the Potato by Bechhold and Erbe's method.]—*Bull. appl. Bot. Select., 1937*, Ser. II, 11, pp. 201–214, 1937. [English summary.]

Details are given of one year's tests, carried out by Bechhold and Erbe's copper strip method [*R.A.M.*, xvi, p. 337 *et passim*], to determine the freedom from degeneration [virus] diseases of the potato material brought to the U.S.S.R. from Central and South America [see next abstract], as well as that of 37 hybrids between these wild and cultivated species and European potato varieties. In almost every case the reaction of the tubers tested to the copper strip was in keeping with their behaviour in the field. The results of similar tests with half-tubers of 481 commercial varieties, the other halves being planted in the field, indicated, however, that the method is not altogether accurate, as apart from the health of the tubers tested, variations in the intensity of reaction also appeared to depend on the variety, the origin of the tubers, and various environmental factors. While the data obtained are inadequate as a basis for definite conclusions, the authors are inclined to agree with Klinkowski [ibid., xv, p. 171] that, until further developed, the method may only be useful in the preliminary determination of the extremes in the state of health of potato planting material.

Sidoroff (F. F.). Селекция Картофеля на иммунитет к **Phytophthora infestans DB.** [The breeding of Potatoes for immunity from *Phytophthora infestans* de Bary.]—*Bull. appl. Bot. Select., 1937*, Ser. II, 11, pp. 5–76, 12 figs., 1 map, 1937. [English summary.]

After giving a general review of the previous and contemporary work done abroad in the attempt to produce potato varieties resistant to late blight (*Phytophthora infestans*), the author describes and discusses at some length the results obtained so far in the U.S.S.R. in similar work carried out with the rich collection, comprising 133 species and

forms of wild, semi-wild, and cultivated species [which are listed] of potato brought back by Russian scientists from South and Central America, and over 70 European cultivated varieties. Artificial inoculation tests in the greenhouse showed that *Solanum andigenum*, a polymorphous cultivated endemic species contains the greatest number of forms resistant to *P. infestans*, most of these occurring in Colombia and Mexico, Bolivia, South and Central Peru coming next in this respect. Forms of *S. tuberosum* from Chile are, as a general rule, more susceptible than varieties grown in temperate latitudes. All the rest of the new cultivated species, which are united under the term 'primitive', were highly susceptible to artificial infection. Although no cultivated varieties or forms were found entirely immune, an increase of resistance was observed in some, either as a result of cumulative breeding, or of mutation. Among the wild potatoes, nine species, namely, *S. demissum*, *S. semidemissum*, *S. verrucosum*, *S. antipoviczii*, *S. ajuscoense*, *S. vallis mexici*, *S. polyadenium*, *S. coyoacanum*, and *S. bulbocastanum*, were found to be immune as a rule from *P. infestans* [but cf. *R.A.M.*, xvi, p. 403], even when artificially inoculated, although in isolated cases (in *S. verrucosum*, *S. ajuscoense*, and some varieties of *S. antipoviczii*) the inoculated plants developed small patches which did not develop further. The immune wild species are all native in Mexico whence most of the resistant cultivated species also originate, and these facts suggest that the development of forms and species is influenced by environmental conditions.

Tests of hybrids produced in the U.S.S.R. showed that although many strains highly resistant to *P. infestans* and possessed of other valuable commercial properties could be observed in the F_1 of *S. andigenum* × *S. tuberosum* crosses, there is little probability of obtaining entirely immune varieties in this way, in view of the important part played by the *S. tuberosum* parent in such crosses. Back-crossing F_1 *S. demissum* × *S. tuberosum* hybrids with *S. tuberosum* in recent years gave very good results in several localities, since it gave forms combining high productivity, equalling that of the *S. tuberosum* parent, with immunity from *P. infestans* in the field; these forms, however, exhibited some undesirable characters, such as poor shape and unpalatability of the tubers, but it is believed that further back-crossing may yield in the third or fourth generation a new acceptable potato variety immune from the disease. Crossing between *S. antipoviczii* and *S. tuberosum* produced hybrids characterized by high productivity and high starch content, but of a low degree of frost resistance and high susceptibility to virus diseases, this limiting their usefulness for breeding purposes.

The possibilities offered by the wild potato species in breeding work do not yet appear to be exhausted; a new direction to further research is suggested by the fact that Mme M. S. Blagovidova, by crossing *S. acaule* with the potato variety Fürstenkrone, both of which are susceptible to *P. infestans*, obtained an immune hybrid, indicating that interspecific hybrids of susceptible parents should also be tested for their reaction to late blight.

[A somewhat condensed account of this work is given by the author in German in *Phytopathology*, xxvii, 3, pp. 211–241, 1 diag., 1937.]

Kargapolova (Mme N. N.). Анатомические особенности различных по устойчивости к **Phytophthora infestans DB.** сортов и видов Картофеля. [Anatomical peculiarities of varieties and species of the Potato, differing in their resistance to *Phytophthora infestans* de Bary.]—*Bull. appl. Bot. Select., 1937*, Ser. II, 11, pp. 215–226, 12 figs., 1937. [English summary.]

From a review of the relevant literature and also from her own anatomical studies of a number of potato species and varieties, ranging in reaction to *Phytophthora infestans* [see preceding abstract] from high susceptibility in *Solanum leptostigma* and *S. aracc-papa* to high resistance in *S. neoantipoviczii* and *S. demissum*, the author concludes that no definite correlation can be established between susceptibility and anatomical structure.

Small (T.). **The control of Potato blight in Jersey.**—*J. Minist. Agric.*, xliii, 12, pp. 1162–1168, 2 pl., 1937.

In this account of the progress made in the control of potato blight (*Phytophthora infestans*) in Jersey [see above, p. 514] the author recommends spraying with Bordeaux or Burgundy mixture at fortnightly intervals beginning when the plants are 8 to 10 in. high. When a good yield of tubers has formed, the haulms should be scorched or cut while the crop is healthy, or at the latest when the disease appears, and the crop may be dug immediately afterwards. Diseased crops should be scorched, not cut, and at least one week allowed to elapse before digging in dry weather and longer in wet weather. When one-half of a 5½ acre field was sprayed twice with Bordeaux mixture, dusted once, and finally scorched with sulphuric acid the treatment effected an estimated saving of £100 through the increased yield of clean tubers. Where infection is prevalent but recent, blight development in the seed tubers after digging may be minimized by immersing them in formalin (1 part of 40 per cent. in 99 of water). In trials conducted in 1935 and 1936 this treatment gave 1,706 healthy and only 48 diseased tubers as against 2,512 healthy and 2,109 diseased for the untreated controls. In one experiment potatoes dug before scorching and undipped, scorched six days before digging and undipped, the same dipped, and not scorched or dipped gave, respectively, 232, 480, 126, and 309 healthy, and 404, 130, 1, and 264 diseased tubers in storage.

Nattrass (R. M.). **Preliminary trial of disinfection of seed Potatoes to control scab.**—*Cyprus agric. J.*, xxxii, 1, p. 23, 1937.

The potato scab organism (*Actinomyces scabies*) does not appear to be normally present in Cyprus soils but has been introduced with imported seed and occasionally appears on the spring crop. In experiments on control, good commercial seed of the Up-to-Date variety treated with an organic mercury compound before export from Ireland yielded on planting in Cyprus 0·0 per cent. scabbed tubers (2 tubers in 300 lb.), compared with 8·6 per cent. for untreated seed. Corresponding figures for severely infected seed tubers of the same variety were 0·78 and 19·8 per cent. respectively. Owing to wet weather at the time of dispatch the treated seed on arrival in Cyprus was slightly moist and showed about 50 per cent. more wastage than the untreated.

Daines (R. H.). **Antagonistic action of Trichoderma on Actinomyces scabies and Rhizoctonia solani.**—*Amer. Potato J.*, xiv, 3, pp. 85–93, 1937.

Trichoderma lignorum was found to produce a diffusible substance toxic to *Actinomyces scabies* [*R.A.M.*, xvi, p. 408] in a synthetic medium consisting of dextrose broth plus either 5 gm. bactopeptone per l. or horse manure infusion. The principle, however, is rapidly destroyed by aeration at the hydrogen-ion concentrations (P_H 5·1 to 5·8) of New Jersey potato soils, besides being removed from solution by charcoal and by the soil itself, so that its practical utility in combating scab is somewhat problematical. It was further ascertained that the introduction of *T. lignorum* into a five-day-old culture of *A. scabies* results in the inhibition of the former, while a soil-inhabiting bacterium produces a substance equally toxic alike to both fungi. In such complex physical, chemical, and biological environments as are afforded by soils, antagonistic relationships like the one herein described are obviously liable to modification or even destruction. No significant improvement in the condition of potato stems infected by *Rhizoctonia* [*Corticium*] *solani* was effected by immersion in a spore suspension of *T. lignorum* [ibid., xvi, p. 268].

Darling (H. M.). **A study of scab resistance in the Potato.**—*J. agric. Res.*, liv, 4, pp. 305–317, 7 figs., 1937.

A summarized account is given of experiments from 1931 to 1934, inclusive, at two centres in Minnesota, in which the resistance of a number of inbred and hybrid potato seedlings to common scab (*Actinomyces scabies*) [*R.A.M.*, xvi, p. 273] was tested in scab-infected soil. The results indicated that resistance to scab is apparently relative, since complete immunity was not observed. The fact that resistant seedlings were found in the progeny of susceptible parents suggested that although most commercial varieties of the potato are susceptible, they may contain factors for resistance, and that, by selfing, plants having these factors may be isolated in a relatively homozygous condition, a view which was confirmed by the inheritance in the tests of resistance in a very high percentage of the progeny of the resistant seedling 5–10–1. Certain susceptible seedlings produced both susceptible and resistant progeny. No consistent relation was determined between scab resistance and the russet type of skin in the tubers, and no difference was found between the stomata of resistant and susceptible seedlings. The lenticels, however, which appear to be the chief point of infection, were larger in the susceptible than in the resistant seedlings; they were also rounder and more loosely arranged in the former, thus offering a better infection court. In the resistant seedlings the periderm of the tuber was suberized earlier than in the susceptible, and the suberization extended farther into the lenticels, apparently affording greater protection against infection of the meristematic tissues. The results of these studies encourage the belief that potato varieties may eventually be produced, combining both scab resistance and desirable commercial qualities.

Yoshii (H.). **Pathological studies on Rice blast, caused by Piricularia oryzae. III. Patho-histological observations of diseased plants.**—*Ann. phytopath. Soc. Japan*, vi, 4, pp. 289–304, 7 figs., 1937. [Japanese, with English summary.]

The diseased portions of rice leaves attacked by blast (*Piricularia oryzae*) [*R.A.M.*, xvi, p. 406] may be divided into three zones—venenate, necrotic, and disintegrated: the first occupying the border of the infected area, often showing a long, pale yellowish stripe and blending gradually into the healthy tissue; the second forming a narrow brown streak along the inner side of the venenate zone or along the vascular bundles within the affected part; while the third and largest zone is greyish-brown and somewhat desiccated. The histopathological changes occurring in the venenate zone, which develops as a result of infiltration by a toxic excretion of the fungus, include discoloration and shrinking of the chloroplasts, degeneration of the cell membrane, and vacuolar or granular disintegration of the protoplasm. The disintegrated zone is formed by the active spread of the hyphae in the tissues of the venenate zone, causing collapse of the cell inclusions and cell walls, a transitional stage of less intensive infection being constituted by the intervening necrotic zone. In general, the pathological modifications of infected nodes of racheae, ear bases, and flag leaves resemble those described for the foliage. The decrease of starch in the affected tissues may be attributed to the conversion of reserve starch into sugar, while its irregular distribution is probably correlated with the feeble diastatic action of the fungus.

Shimada (S.). **Studies on the wound infection of the Rice plant by Piricularia oryzae.**—*Ann. phytopath. Soc. Japan*, vi, 4, pp. 307–318, 1937. [Japanese, with English summary.]

Rice leaves wounded by various methods invariably developed more lesions in response to inoculation with a conidial suspension of *Piricularia oryzae* [see preceding abstract] than uninjured ones, the effects being more noticeable under conditions of poor nutrition and when the plants were vigorously shaken before infection. The cuticular layer of the leaf mould thus appears to contribute materially to the resistance of rice to the blast disease.

Harmsen (J. R.). **Bruine binnenbastziekte.** [Brown bast disease.]—*Bergcultures*, xi, 11, pp. 351–355, 2 figs., 1937.

This is a critical survey of some outstanding contributions to the knowledge of brown bast of *Hevea* rubber, with special reference to their bearing on the etiology and control of the disease in the Dutch East Indies [*R.A.M.*, xvi, p. 340]. Severe attacks of the disorder are stated to be now exceptional as a result of conservative tapping methods, and it is seldom that therapeutic measures are required. The writer's method of control by curtailing the tapping cut was successfully applied in 1921–2 and again in 1930–4, especially in young, vigorous plantations.

Niethammer (Anneliese). **Die mikroskopischen Bodenpilze.** [The microscopic soil fungi.]—*Tabul. biol., Berl.*, vi, 3, pp. 279–284, 1937.

The writer presents in tabular form the data resulting from her

studies on soil fungi, some of which have already been noticed from another source [*R.A.M.*, xiv, p. 655]. Attention is drawn to the great utility of Mme Kubiena's method of direct microscopic examination of soil organisms [ibid., xiv, p. 392]. The distribution of the latter is considered from the geographical, pedological, and botanical standpoints. Generally speaking, the Mucorineae prefer temperate climates and soils of a China clay or ashen consistency, species of *Penicillium* predominate in the brown Central European soils, while the Aspergillaceae are at home in the subtropical red-brown or tropical black soils. Mucorineae, especially *Mucor ramannianus*, are prevalent in coniferous forests [ibid., xiv, p. 655; xv, p. 520], while *Penicillium* spp. and (in subtropical regions) *Monilia* spp. abound among hardwoods. Orchard soils are mostly occupied by species with a certain affinity for fruits, such as *Mucor racemosus*, *P. expansum* [ibid., xvi, p. 189], *Botrytis cinerea*, and *Dematium* [*Pullularia*] *pullulans*, and the same applies to vineyards. Meadow soils contain chiefly *Zygorrhynchus moelleri* [ibid., xiv, p. 655; cf. also xvi, p. 407] and *Cladosporium herbarum*, together with numerous species of *Fusarium*. Soil fungi, mainly *M. hiemalis* [ibid., xiv, p. 655], *M. flavus*, *Penicillium notatum* [ibid., xiii, p. 572], *C. herbarum*, and *F.* spp., occur in profusion in virgin soil, wayside paths, stony slopes, and the like, while arable land is poorer in these organisms, which are principally represented by *M. racemosus*, *P. crustosum*, *P. expansum*, *C. herbarum*, and *F.* spp. *Trichoderma koningi* [see below, p. 575], *P. solitum*, and *Z. moelleri* are found in moorland soils. *Rhizopus nigricans* is present in marked profusion under sugar beets [ibid., xv, p. 765], while kitchen-garden soils are occupied by a great variety of fungi. *T. koningi* and other fungi exert a certain chemotherapeutic action on various plant parasites, e.g., *Rhizoctonia*, *Phytophthora*, and *Phoma* spp. [cf. ibid., xvi, p. 408], while *Rhizopus* and *Aspergillus* spp. secrete growth-promoting substances [ibid., xv, p. 110]. The Mucorineae are chiefly concerned in the disintegration of nitrogenous and albumin compounds, while cellulose is destroyed by species of *Aspergillus*, *Penicillium*, *Botrytis*, *Monilia*, and *Trichoderma*, the last-named also utilizing nitrogen.

SINGH (J.). **Soil fungi and actinomycetes in relation to manurial treatment, season, and crop.**—*Ann. appl. Biol.*, xxiv, 1, pp. 154–168, 2 pl., 6 graphs, 1937.

The examination in 1931–2 of soil samples taken from two fields in Rothamsted, one of which had been permanently kept under wheat since 1843 and the other under root crops since 1856 (mangolds since 1876) (the two had received differential manures throughout), established a direct correlation between soil fertility, as measured by the yield of the crops, and the number of soil fungi and actinomycetes contained in them. Only inconclusive or negative evidence, however, was obtained with regard to the periodicity of the organisms, though there was a tendency for the numbers throughout the year to fluctuate about a mean value, with an indication of lower numbers in the winter [*R.A.M.*, vii, p. 740 *et passim*]. While the nature of the crop did not appear to have a marked effect on the numbers of the micro-organisms studied, there was a suggestion that actinomycetes were more numerous

under wheat and fungi under the mangolds. No support was found for the view that particular manurial treatments favour the development of specific soil fungal floras, but higher fertility was directly correlated with a greater variety of soil fungi. Species of *Penicillium* and forms of *Dematium* were more prevalent in the mangold field, and *Fusarium* spp. tended to predominate under the wheat; *Monilia* spp. were fairly uniformly distributed in the two fields, but *Aspergillus* and *Mucor* were scarce.

MULLER (H. R. A.). **Het Phytophthora-voetrot van Peper (Piper nigrum L.) in Nederlandsche-Indië.** [The *Phytophthora* foot rot of pepper (*Piper nigrum* L.) in the Dutch East Indies.]—*Meded. Inst. PlZiekt., Batavia*, 88, 73 pp., 6 pl., 2 diags., 1 map, 1936. [English summary. Received March, 1937.]

Since 1928 foot rot of pepper (*Piper nigrum*) has assumed major importance in most of the cultivation centres in Sumatra, Java, and Borneo [*R.A.M.*, xiv, p. 152] and has recently been observed on the island of Bangka. In some districts the ravages of the disease have necessitated the abandonment of the crop.

Infection usually begins on the stems at a height of up to 30 cm. from the base; on non-suberized stems the diseased cortex rapidly turns from dark watery green to black, but no external symptoms are apparent on cork-covered bark. The soft parenchymatous tissues of the cortex and medullary rays quickly decay, while the xylem remains intact apart from a slight brownish discoloration. The affected bark often peels off and the central cylinder splits into a bundle of loose xylem vessels due to the rotting of the connecting tissues. The leaves turn yellow, wilt, and drop, or in dry, hot weather they may blacken and adhere to the plants. Most of the roots of wilting plants are still normal but foot rot symptoms begin at the base and progress towards the root tips. During the period of active spread of the disease somewhat inconspicuous, greyish-brown spots up to 5 cm. in diameter, are formed near the tips and margins of the lower leaves; the lesions are surrounded by a zone, 3 to 5 mm. in width, of watery, dark green tissue, from the under side of which drops of a yellowish fluid are exuded.

Inoculation experiments on pepper plants with six cultures of a *Phytophthora* isolated from diseased material gave positive results, whereas nine strains from other hosts failed to cause infection. The pepper *Phytophthora* was shown to be capable of infecting papaw, cacao, rubber (*Hevea brasiliensis*), *Ricinus communis*, eggplant, tobacco, *Phalaenopsis amabilis*, and *Colocasia antiquorum*, but the symptoms it induced were in general less virulent than those caused by the species proper to these hosts viz., *P. palmivora* in the case of the three first-named [ibid., xv, p. 345], *P. parasitica* from *R. communis* [ibid., xv, p. 378] and eggplant, *P. parasitica* var. *nicotianae* from tobacco [ibid., xvi, p. 413], *P.* sp. from *Phalaenopsis amabilis*, and *P. colocasiae* from *C. antiquorum* [ibid., xvi, p. 301]. Both leaf surfaces of pepper are readily infected by the mycelium and conidia of the *Phytophthora*, the zoospores of which, however, can only attack the under sides. The typical lesions develop in two to three days; during the night conidia

are formed in profusion on the lower leaf surfaces. Diseased leaves are usually shed before the fungus reaches the petioles.

According to Tucker's system of classification all the pepper strains belong to *P. palmivora* [ibid., x, p. 754], but the strong preference of the fungus under discussion for pepper and its high temperature optimum for growth on potato dextrose agar (31° C.) are considered to entitle it to varietal rank as *P. palmivora* var. *piperis* [of which no Latin diagnosis is given]. In agar cultures oogonia are extremely rare, but these organs may be formed in abundance when the pepper strains are grown in conjunction with other *palmivora* strains on maize meal agar slants. Only amphigynous antheridia have been observed; on oatmeal agar the oospores measure 22 to 34·1 μ in diameter (mean 26·6 μ).

The chief sources of infection by *P. palmivora* var. *piperis* are contaminated soil, water, and diseased plant refuse. Transport by water seems to be the chief mode of conveyance of the fungus, which is most destructive in well-cultivated gardens. Zoospore production is stimulated by the falls of temperature liable to follow heavy tropical rains. Infection is most prevalent in the second half of the west monsoon, when dull, damp conditions maintain the conidia in a viable state throughout the day, whereas direct exposure to the sun during the dry monsoon may even destroy the fungus in the leaves.

Experiments in the west of Borneo have shown that the foot rot of pepper may be partially controlled by fortnightly applications of 1 per cent. Bordeaux mixture, while in the Lampong Residency (south Sumatra) a highly resistant variety known as 'lada belantoeng' has been developed and is now largely superseding the old susceptible types.

In order to minimize the risk of soil infection, a network of shallow drain trenches should be dug, with water pits at intervals to prevent the rain water from running off over the soil surface. When infection occurs in one of the squares isolated by the trenches the soil and the diseased plants should be watered with 5 to 10 l. of a 1 per cent. copper sulphate solution per sq. m., and weeding should be temporarily discontinued to prevent the transmission of the fungus by implements, on the labourers' feet, or by similar means.

BALDACCI (E.). **Prime ricerche sulla patogenicità di alcuni Fusarium per le piante di Ricino.** [Preliminary studies on the pathogenicity of some *Fusarium* spp. to Castor Oil plants.]—*Boll. Soc. ital. Biol. sper.*, xii, 3, pp. 105–106, 1937.

Samples of diseased castor oil [*Ricinus communis*] plants examined by the writer at the Pavia Cryptogamic Laboratory yielded *Fusarium scirpi* [*R.A.M.*, xv, pp. 746, 765], *F. moniliforme* [*Gibberella moniliformis*], *F. semitectum* [ibid., xvi, p. 324], and a species of *Verticillium*. Inoculation experiments with pure cultures on Pollacci's medium of *F. semitectum, G. moniliformis*, and *G. pulicaris* (*F. sambucinum*) [ibid., xvi, p. 434], the last-named supplied by Wollenweber, gave negative results. However, 9 out of 27 seedlings raised from seeds naturally infected at their apices and kept either in a greenhouse at 27° or under a bell-jar at 20° C. contracted the typical desiccation of the growing points associated with the disease; from three of the

affected plants a *Fusarium* was isolated and from two a *Macrosporium*. Twelve seedlings from the same batch of seed kept in the open remained healthy.

It would appear from these data that the species of *Fusarium* involved in the castor oil disease (the etiology and symptomatology of which are to be further discussed at a later stage of the investigations) are only pathogenic to plants weakened by adverse environmental conditions.

BALDACCI (E.). **Prove di disinfezione dei semi di Ricino.** [Disinfection experiments with *Ricinus* seeds.]—*Boll. Soc. ital. Biol. sper.*, xii, 3, pp. 106–107, 1937.

The treatment of castor oil [*Ricinus communis*] seeds against species of *Fusarium* and *Macrosporium* [see preceding abstract] with 0·25 per cent. Caffaro powder or uspulun (one hour's immersion) resulted in an average germination of 85 and 83 per cent., respectively, compared with 79 per cent. for the untreated controls. The fungi developed on 6 out of 37 of the seedlings from Caffaro-treated seed and on 3 out of 37 in the lot disinfected with uspulun.

STOREY (H. H.). **The introduction of Sugar-Cane varieties.**—*E. Afr. agric. J.*, ii, 5, pp. 390–391, 1937.

The procedure adopted in Tanganyika Territory to regulate the introduction of new sugar-cane varieties so as to minimize the risk of bringing in disease is as follows. Any planter desiring a variety from overseas must write to his Department of Agriculture, who pass on the request to the Central Quarantine Station, Amani, who, in turn, obtain the variety and grow it in the small, isolated quarantine houses. When the material has passed the requisite tests, a process requiring about two years, the applicant is informed. Usually 50 to 100 setts only are available and are issued at a price of 50 cents each, to cover the expenses of quarantine.

MARTIN (J. P.). **Pathology.**—*Rep. Hawaii. Sug. Exp. Sta., 1936* (ex *Proc. Hawaii. Sug. Pl. Ass., 1936*), pp. 28–35, 1937.

In this report [cf. *R.A.M.*, xv, p. 559] it is stated that preserved sugar-cane leaves from Guam showed the presence of rust [*Puccinia kuehnii*: ibid., xi, p. 203], brown stripe [*Helminthosporium stenospilum*: ibid., xvi, p. 206], leaf freckle, and two unknown leaf spots. Banded chlorosis [ibid., xiii, p. 397] was prevalent on H 109 canes on Maui and Oahu during winter, low temperature injuries sometimes causing important losses locally. Chlorotic streak [fourth disease: ibid., xvi, p. 205] was closely associated with nutritional factors, the symptoms sometimes being most pronounced in soils deficient in potassium. Transmission occurred on cuttings, and in certain environmental conditions healthy canes often became affected, but it is considered that favourable growth conditions will much reduce the severity of the disease. Similar symptoms were observed on elephant grass [*Typha elephantina*]. The results of experiments by C. W. Carpenter supported earlier observations that in certain soils phosphorus and calcium increase the resistance of sugar-cane roots to *Pythium* root rot [*P.*

graminicolum: ibid., xiii, p. 471; xv, p. 560]. The better growth of *Panicum barbinode* [*P. molle*] as compared with Sudan grass [*Sorghum sudanense*] in certain growth-failure soils is due to its resistance to *Pythium* root rot. The evidence obtained indicated that a short cropping system reduces the incidence of leaf scald [*Bacterium albilineans*: ibid., xvi, p. 160]; aqueous solutions of sulphurous acid, methylene blue, copper sulphate, and zinc chloride (1 in 100,000) were toxic to the causal organism after 24 hours.

Černik (L.). **Krankheiten und teratologische Missbildungen an Pflanzen der Olmützer Flora.** [Diseases and teratological malformations of plants of the Olmütz flora.]—*Verh. naturf. Ver. Brünn*, lxviii (*1936*), pp. 49–78, 16 figs., 1937.

The following are among the records of phytopathological interest in this annotated list of diseases, pests, and teratological malformations of plants in the Olmütz district of Czecho-Slovakia. Snapdragon [*Antirrhinum majus*] rust (*Puccinia antirrhini*) [see above, p. 515], first observed locally in 1935 [*R.A.M.*, xv, p. 370], spread in 1936 and completely destroyed the plantings in some nurseries and private gardens. A black discoloration of cabbage leaves was found to be caused by *Leptosphaeria napi*. *Clematis jackmanni* was affected by an obscure disorder, involving a black spotting extending over the entire leaf and rapid dying-off of the shoot down to the root-stock. The aecidial stage of *Gymnosporangium juniperinum* was observed on *Sorbus* [*Pyrus*] *aucuparia* [ibid., xv, p. 609]. Various fungi have been implicated in the formation of alder (*Alnus glutinosa*) mycorrhiza, namely, *Schinzia alni* Woron., *Frankia subtilis* Brunch., *F. alni* P. Magn., and *Actinomyces alni* [ibid., xiv, p. 590].

Chupp (C.) & Linder (D. H.). **Notes on Chinese Cercosporae.**—*Mycologia*, xxix, 1, pp. 26–33, 1 pl., 1937.

This annotated list of 15 species of *Cercospora* found in China includes *C. cylindrata* n.sp. on leaves of *Dioscorea* sp., *C. leguminum* n.sp. on (?) *Crotalaria* leaves [both with Latin diagnoses]; *C. pachyderma* on *Dioscorea* spp., *C. meliae* Ell. & Ev. on *Melia*, with white spots, brown stromata, short conidiophores, and obclavate conidia resembling those of *C. leucosticta* and *C. subsessilis* [ibid., xvi, p. 493], *C. personata* [loc. cit.] on *Arachis*, and *C. snelliana* on *Morus*.

Maire (R.). **Fungi catalaunici: series altera. Contribution à l'étude de la flore mycologique de Catalogne.** [Catalan fungi: second series. A contribution to the study of the mycological flora of Catalonia.]—*Publ. Inst. bot. Barcelona*, iii, 4, 128 pp., 8 figs., 1937.

An annotated list is given of the fungi collected by the writer in October, 1933, in Catalonia, including 205 new species and varieties [with Latin diagnoses]. *Coniothyrium lavandulae* n.sp. ad int., found on dead lavender (*Lavandula vera*) leaves, is characterized by subglobose pycnidia, 75 to 140 μ in diameter, producing smooth, chestnut-coloured, shortly ovoid, often subangulate, thick-walled (1 μ) spores, 5 to 6 by 4 to 5 μ. *Sphaeria ceratosperma* is renamed *Valsa ceratosperma* (Fr. ex Tode) Maire comb. nov. (syn. *V. ceratophora*). *Lophodermium*

nervisequum was found on *Abies alba* needles [ibid., v, p. 709] and *L. pinastri* [ibid., xv, pp. 610, 683] on those of *Pinus montana* and *P. pinea*. Witches' brooms are formed on *Quercus ilex* by *Taphrina kruchii* (Vuill.) Sacc.

Codinaea is described as a new genus of the Dematiaceae-Myxotrichelleae allied to *Ellisiella* and *Myxotrichella*, but differing from the former in its elongated, septate conidiophores and capitulate conidia, and from the latter in its simple sterile hyphae, free conidiophores, and ciliate conidia.

DA CAMARA (E. DE S.), DE OLIVEIRA (A. L. B.), & DA LUZ (C. G.). **Mycetes aliquot Lusitaniae. I in Laboratório Pathologiae Vegetalis Instituti Agronomici Olisipponis observata.** [Some fungi of Portugal studied at the Phytopathological Laboratory of the Lisbon Agronomic Institute. I.]—Reprinted from *Rev. agron., Lisboa*, xxiv, 2, 37 pp., 4 pl., 1936. [Received April, 1937.]

Eleven of the species in this annotated list of nearly 100 fungi are new to science and furnished with Latin diagnoses, while a number of other records represent additions to the knowledge of the mycoflora of Portugal [see next abstract]. Onion leaves were infected by *Puccinia allii* [*R.A.M.*, xv, pp. 57, 633], the aecidial and uredospore stages only being observed. The foliage of *Papaver rhoeas* was attacked by *Entyloma fuscum* [ibid., xvi, p. 515] and *Peronospora arborescens* [ibid., xiii, p. 445]. *Buxus sempervirens* leaves were infected by *Hyponectria buxi* [ibid., vi, p. 619]. *Taphrina aurea* was observed on poplar foliage [ibid., xiv, p. 665]. *Urophlyctis alfalfae* attacked the shoots of *Medicago* sp. [ibid., xv, p. 776] and *U. trifolii* the leaves of *Trifolium cherleri* [ibid., vi, p. 123]. Lemon leaves bore irregular, whitish, apical lesions with pale chestnut borders surrounded by a sinuous, blackish-brown line in association with *Macrophyllosticta* (*Phyllosticta*) *citri* n.sp. *M.* (*P.*) *oleae* n.sp. occurred with *Coniothyrium oleae* on ashen-grey spots with prominent, brown margins at the tips of olive leaves. *Sphaeropsis pelargonii* n.sp. was observed on *Pelargonium zonale* shoots. The foliage of *Antirrhinum majus* bore yellowish, purple to brown-edged lesions caused by *Septoria antirrhini* [ibid., xv, p. 683]. *S. gladioli* was detected on *Gladiolus* leaves [ibid., xiv, p. 193]. The light yellowish-brown, depressed-globose, erumpent acervuli, 150 to 250 μ in diameter, of *Gloeosporium evonymicolum* n.sp. were found on *Euonymus japonicus* leaves. *Phleospora rosae* n.sp. forms subcircular to ellipsoid, sometimes confluent, ashen-grey spots, bordered by a blackish-purple zone, up to 2·5 mm. in diameter, scattered over the surface of cultivated rose leaves.

DA CAMARA (E. DE S.). **Contributiones ad mycofloram Lusitaniae XI.** [Contributions to the mycoflora of Portugal. XI.]—Reprinted from *Bol. Agric., Lisboa*, II, Sér. I, i, 88 pp., 100 figs., 1936. [Received April, 1937.]

Twenty-eight of the fungi enumerated in this copiously annotated contribution, comprising nearly 200 records, to the mycoflora of Portugal [*R.A.M.*, xii, p. 725 and preceding abstract] are new to science and are furnished with Latin diagnoses, while a large proportion of the

remainder were hitherto unknown in the country. The ovaries of *Lolium temulentum* were invaded by *Tilletia lolii* [ibid., xii, p. 156]. *Pyrenophora polytricha* n.sp., characterized by black, circular to piriform perithecia, erect, cuspidate, pluriseptate setae, 240 to 320 by 8 to 12 μ, and aparaphysate, oblong to clavate, sessile asci, 135 to 200 by 35 to 64 μ, containing eight elongated to ovoid or slightly claviform, transversely 4- to 6-, mostly 5-septate, straw-coloured ascospores, 46 to 62 by 19 to 24 μ, was found occupying the culms of oats (*Avena sterilis*); its conidial stage, *Helminthosporium olisipponense* n.sp., may be recognized by its simple, multiseptate, flexuous, pale reddish conidiophores, 40 to 90 by 4 to 4·5 μ, bearing more or less fusoid or ellipsoid, 6- to 9-septate, pale tawny conidia, 37 to 65 by 8 to 11 μ. *Podosphaera leucotricha* [ibid., xvi, p. 262] was observed on apricot leaves. The foliage of tea plants was infected by *Macrophyllosticta* (*Phyllosticta*) *unamuniana* n.sp., producing irregular, brown spots with sooty-black borders near the leaf apices, and characterized by pycnidia, 160 to 250 μ, with an ostiole about 40 μ in diameter and by greenish-yellow variable spores, 15 to 30 by 5·5 to 9 μ. Apple leaves were attacked by *Phyllosticta mali* [ibid., xii, p. 330]. *Ceratostomella ulmi* was isolated in pure culture from elm (*Ulmus glabra*) wood from the Lisbon Zoological Gardens [ibid., xiv, p. 264]. Bean (*Phaseolus vulgaris*) leaves were infected by *Isariopsis griseola* [ibid., xiv, pp. 396, 734].

LEACH (R.). **Observations on the parasitism and control of Armillaria mellea.**—*Proc. roy. Soc.*, Ser. B, cxxi, 825, pp. 561–573, 3 pl., 1937.

In studies on *Armillaria mellea* [*R.A.M.*, xvi, pp. 215, 355], which causes serious losses to tea in Nyasaland [ibid., xvi, p. 209], the author states that when germinating tea seeds and 18-month-old tea plants were planted over infected pieces of *Gliricidia maculata* [*G. sepium*] roots, only the seedling roots and new feeder roots from the older plants that came into contact with fresh rhizomorphs developed infection. One month after planting very few of the seedling roots showed penetration, though many had firmly attached rhizomorphs. Some were brown on each side of the rhizomorph, and the cortex of a few was split longitudinally by an internal rhizomorph travelling upwards. After two months the internal rhizomorphs had advanced up and down the seedlings for a total length of 2 to 12 cm.

Penetration occurred as described by Thomas [ibid., xiii, p. 552]. The rhizomorph was attached to the root by a hyphal mat; no hypha entered any cell, and no mucilaginous attachment to the root was apparent. The rhizomorph progressed between the cortex and xylem and sometimes in the pith only, the tip advancing upwards as a massed hyphal unit, individual hyphae growing out from the sides behind. In both healthy and infected seedlings the pith is rich and the cortex poor in starch. In virgin forest only a very small percentage even of a susceptible species is killed by *A. mellea*, but after felling the roots become heavily infected.

As a result of these observations a method of biological control is suggested that aims at preventing the infection of forest tree roots by *A. mellea*. In the infection experiment described above, the fact that hyphae from the internal rhizomorph developed freely in the xylem

and pith and not at all in the cortex of the seedlings indicated that the fungus requires abundant carbohydrate supplies, and this view was supported by cultural studies. The roots of normally felled trees have a high carbohydrate content, but it was thought that if they were depleted of starch before felling by ring-barking to prevent the passage of the carbohydrates to them from the foliage, they would be less susceptible to *A. mellea* and more so to harmless saprophytes such as *Rhizoctonia bataticola* [*Macrophomina phaseoli*] and *Botryodiplodia theobromae*, which develop freely in roots low in carbohydrates.

Evidence in favour of this hypothesis was obtained as follows. The roots of healthy *Parinarium mobola* trees (highly susceptible to *A. mellea*) after felling contain starch, whereas the roots of ringed trees gradually become deprived of it, though remaining healthy until defoliation is complete. Examination of the roots of 24 felled (unringed) *P. mobola* trees showed that 54 were affected by a dry rot, uniformly brown, with an easily separable bark, and bore sclerotia of the *M. phaseoli* type, while 186 showed rot due to *A. mellea*. Six other ringed *P. mobola* trees had roots free from fungi, while 12 others, also ringed, had one (doubtful) case of *A. mellea* infection, with 113 dry-rotted roots. These figures show that the ringing removed the main source of danger to ensuing susceptible crops, and appear to lend strong support to the author's views.

Large-scale ringing experiments have been started but at least three years will be required before the results are available. A schedule will have to be worked out for opening up forest areas. In forests of both resistant and susceptible trees the ringing of the latter might be effected many years before the land is required, provided the number of resistant trees are sufficient to protect the land from denudation, whereas in forests of susceptible trees only it would be necessary to know the least time required by different-sized trees of each species to render the roots susceptible to the innocuous fungi only.

PITTMAN (H. A. J.). **Disinfection of Tobacco seed.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xiv, 1, pp. 93–95, 1937.

Brief directions are given for the disinfection of tobacco seed against seed-borne diseases with mercuric chloride (1 in 1,000), silver nitrate [*R.A.M.*, xv, pp. 61, 777] (1 in 1,000 for 15 minutes), and absolute alcohol (1 lb. per 1 lb. of seed, for 5 minutes), the methods of preparing and using the disinfectants being clearly explained. The alcohol method has the advantage that the treated seed dries very quickly.

PARK (M.) & FERNANDO (M.). **Some studies on Tobacco diseases in Ceylon. I.**—*Trop. Agriculturist*, lxxxviii, 3, pp. 153–168, 2 pl., 1937.

In experiments at the Experiment Station, Wariyapola, tobacco seedlings of Harrison's Special variety were grown in carefully prepared burnt-over beds from untreated seed and seed subjected to 15 minutes' immersion in a 0·1 per cent. solution of silver nitrate [see preceding abstract] (both lots having been carefully cleaned before storage) and sprayed with bouisol [*R.A.M.*, xiv, p. 200 *et passim*] (1 oz. per gall. water) plus agral ($\frac{1}{8}$ oz. per gall.) as a spreader at weekly intervals from the eighteenth day after sowing until transplanting when seven weeks

old. Diseased plants, affected by *Pythium* sp., were removed each day and counted. The sprayed plants from both lots of seed averaged 16·25 damped-off seedlings per unit area as against 288·25 for the unsprayed, this difference being highly significant though the seed treatment exercised no effect on the incidence of the disease.

No frog eye (*Cercospora nicotianae*) [ibid., xv, p. 704; xvi, p. 412] appeared in the nursery beds, demonstrating that by the use of clean, carefully selected seed and by proper preparation of the beds the disease can be avoided. During the sixth week after transplanting counts of 200 leaves taken at random gave means of 37·25 and 30·5 leaves infected with frog eye for the sprayed plants, from sterilized and unsterilized seed, respectively, the corresponding figures for the unsprayed plants being 98·75 and 97·5, respectively. Thus, the effect of spraying on the incidence of *C. nicotianae* was highly significant, but that of seed disinfection was insignificant, the variation between the two factors being subnormal. Infection was not only less prevalent but also less intense on the sprayed than on the unsprayed plants. The distribution of infected plants was uniform and almost always the lowest leaves were the first to be infected. The authors conclude that the main source of frog-eye infection of the newly planted crop is probably from spores perennating in the soil. Air-borne infection does not occur over any considerable distance.

Braun (A. C.). **A comparative study of Bacterium tabacum Wolf and Foster and Bacterium angulatum Fromme and Murray.**—*Phytopathology*, xxvii, 3, pp. 283–304, 4 figs., 1937.

Comparative studies were made of the progeny of six single-cell strains of *Bacterium angulatum* and four of *Bact. tabacum* from southern Wisconsin of known pathogenicity to tobacco with a view to determining the possible relationship or identity of the two organisms as suggested by Stapp [*R.A.M.*, x, p. 61].

Attempts to secure differential characters of the two organisms by means of morphological, cultural, physiological, or serological methods gave negative results, greater differences being apparent between the individual strains of the bacteria than between the two types themselves. *Bact. tabacum* showed a tendency to lose its capacity for the secretion of a soluble exotoxin after protracted periods of culture, generally leading to reduction of aggressiveness or invasive power and to the development on the inoculated Havana No. 38 tobacco plants of symptoms comparable to those induced by *Bact. angulatum*. From the evidence available it would seem preferable to regard *Bact. angulatum* as a variety of *Bact. tabacum* rather than to combine the two species under the latter name. Investigations on the control of both diseases should be carried out with *Bact. tabacum*, the presence of which in seed-beds is much more rapidly and certainly established than that of *Bact. angulatum*.

Trotter (H.). **La 'maculazione ad anello' nelle foglie del Tabacco.** [Ring spot of Tobacco leaves.]—*Boll. tec. Tab.*, xxxiv, 1, pp. 51–60, 6 pl., 1937. [English summary.]

A summary is given of the available information concerning ring

spot of tobacco [*R.A.M.*, xvi, p. 344], an outbreak of which was observed for the first time at Scafati (Salerno) on 4th June, 1934, on a number of oriental varieties in the field. With a rise in temperature, culminating on the 12th, the yellowish or pale green, zonate lesions completely disappeared from the leaves, in which the virus had evidently assumed a latent form. There is reason, however, to suppose that the latent effects of ring spot may persist and cause storage defects [cf. ibid., xv, p. 689]. The disease was again observed on 16th July, 1935, on a limited number of plants of a cross between Platana and Sary Chandasienicz, and on 11th July, 1936, in a mild form on a few Burley plants. In the greenhouse ring spot developed in 1936 on Havana (20th June), Virginia (30th November), and *Nicotiana tomentosa*, a highly susceptible host on which the symptoms appeared in the 'oak leaf' form [ibid., xii, p. 697]. A single plant of *N. tomentosa* among five separated from each other by less than a metre has been severely affected by ring spot for nearly two years without communicating the disease to the rest of the group.

STANLEY (W. M.). **Crystalline Tobacco-mosaic virus protein.**—*Amer. J. Bot.*, xxiv, 2, pp. 59–68, 2 figs., 1937.

In this paper, read before the American Association for the Advancement of Science on 29th December, 1936, and awarded the prize of the Association, the author after briefly reviewing the history of tobacco mosaic investigations, recapitulates and discusses his own researches on the problem [*R.A.M.*, xvi, p. 499] with references to the results obtained by other workers. The conclusion is reached that the protein is itself the virus. A comprehensive bibliography of 72 titles is appended.

LAVIN (G. I.) & STANLEY (W. M.). **The ultraviolet absorption spectrum of crystalline Tobacco mosaic virus protein.**—*J. biol. Chem.*, cxviii, 1, pp. 269–274, 1 diag., 1 graph., 1937.

The ultra-violet absorption spectrum of crystalline tobacco mosaic virus protein [see preceding and next abstracts] has been determined by means of a Spekker spectrophotometer for the extinction coefficients and a small Hilger quartz spectrograph to locate the narrow bands of aromatic amino acids constituting the broad absorption band of proteins with a maximum at 2,650 Å. The present interpretation (admittedly tentative pending the development of a more accurate photometer than is yet available) of the composition of the narrow bands of pepsin is that the one lying in the region of 2,920 Å is due to tryptophane, that at 2,840 Å to tyrosine, the broad region from 2,720 to 2,810 Å results from the overlapping of tryptophane and tyrosine, while phenylalanine is the source of those occurring between 2,500 and 2,700 Å. The virus protein has a well-marked and very persistent tryptophane band, which is apparently in the same position as in the case of other proteins, but the tyrosine band is replaced by a much wider one, shifted towards the ultra-violet and absent from all the other proteins examined.

It was found possible to demonstrate the presence of the virus

protein in the semi-purified juice of mosaic Turkish tobacco plants by means of ultra-violet absorption spectrum measurements.

Price (W. C.) & Gowen (J. W.). **Quantitative studies of Tobacco-mosaic virus inactivation by ultra-violet light.**—*Phytopathology*, xxvii, 3, pp. 267–282, 1 diag., 1 graph, 1937.

The survival values of the tobacco mosaic virus exposed at a distance of $7\frac{1}{2}$ in. to ultra-violet light from a Cooper Hewitt mercury lamp with a spectrum commencing at 2,175 Å and having strong lines at 2,260, 2,285, 2,305, and 2,325 Å and so forth, operated on a direct current of 110 volts, were found to follow a simple exponential curve. Assuming radiant energy to be absorbed in discrete units, this curve may be obtained when one unit of energy absorbed in a virus particle is sufficient to cause its inactivation, the rate of which will depend on the amount of energy proper to the virus. The data show the rate of inactivation to be greatest when the virus is most purified (in a solution of crystalline material) [see preceding and next abstracts] and the solution contains least extraneous matter to absorb the energy. The inactivation rate is lowered by the addition of healthy tobacco plant juice to purified virus. The rate for the crystalline material plus healthy tobacco plant juice is substantially identical with that for the virus in diseased plant juice. The inactivation rate for the virus in non-purified dried juice follows essentially the same curve as that for the wet material, except that a portion of the virus fails to undergo inactivation even after protracted periods of exposure. The latter phenomenon is attributed to the fact that the dried virus particles, by reason of their fixed position, may be overlaid by other material and thus shielded from the ultra-violet rays.

Stanley (W. M.) & Wyckoff (R. W. G.). **The isolation of Tobacco ring spot and other virus proteins by ultracentrifugation.**—*Science*, N.S., lxxxv, 2198, p. 181, 1937.

As chemical methods for the isolation of crystalline virus protein [see preceding and next abstracts] were unsuccessful when used with plants affected with the less stable viruses, such as tobacco ring spot, potato latent mosaic, cucumber mosaic, and severe etch, only partial purification and a limited degree of concentration being obtained, the protein from the Turkish tobacco ring spot virus was isolated by ultracentrifuging. The virus being unstable and becoming inactivated at room temperature in one day, the work was done at about 2° C., and the ultracentrifugation performed in a quantity head precooled to about 0°. The virus activity was separated from most of the protein in one ultracentrifugation. Several of the small pellets were combined, suspended in 0·1 M phosphate buffer at P_H 7 and spun on a Swedish angle centrifuge for 15 minutes. The supernatant liquid was then ultracentrifuged, and two repetitions carried out of alternate ultracentrifugation, re-solution of the protein, and low-speed angle centrifugation. The pellet obtained consisted of crystalline protein with a trace of insoluble matter, about 0·005 to 0·01 mg. of protein per gm. of starting material being obtained on each of four occasions. In each of ten tests solutions containing only 10^{-7} gm. of the protein per c.c.

caused necrotic lesions on *Vigna sinensis* [*V. unguiculata*], the protein being approximately 10,000 times more active than the starting material.

In contrast to tobacco mosaic virus protein the ring spot virus protein is almost totally denatured and inactivated after one hour at P_H 3, completely so after 5 minutes at 64°, and is partially and nearly wholly inactivated after 1 and 6 days respectively, at room temperature. It loses only little activity after one hour at P_H 9·6 but is completely denatured and inactivated by one hour at P_H 10·8.

The serological properties of the two proteins are also quite different, the sera of animals injected with tobacco mosaic virus protein giving a precipitate when mixed with solutions containing 10^{-6} gm. of mosaic protein per c.c., but not when mixed with solutions containing even 10^{-3} gm. of ring spot virus per c.c. A sample of ring spot virus containing a trace of tobacco mosaic virus protein was purified by the addition to it of antiserum to mosaic virus protein and removal of the precipitated mosaic virus protein by low-speed angle centrifugation, the ring spot protein being separated from the excess antiserum by ultracentrifugation. Further, the X-ray diffraction pattern of crystalline ring spot virus protein differs from that of mosaic protein. It was therefore possible to isolate from ring spot Turkish tobacco plants a protein possessing the properties of ring spot virus and differing markedly from mosaic virus protein.

The protein in the pellets obtained by this method from Turkish tobacco infected with potato latent mosaic (X virus) was of a single molecular species with a sedimentation constant $S_{20} = c.$ 110, close to that of the ring spot virus protein. In the case of Turkish tobacco infected with severe etch the pellets were larger than those of latent mosaic and contained all the virus activity, the protein sedimenting more diffusely than those of ring spot and latent mosaic. Ultracentrifugation of the juice from Turkish tobacco plants infected with cucumber mosaic gave insufficient soluble protein for physical and chemical tests, although all the virus activity was concentrated at the bottom of the tubes. Attempts to concentrate the juice before ultracentrifugation were unsuccessful.

The data obtained show that high molecular weight proteins are characteristic of these diseases and that the properties and concentration in the host of the proteins differ greatly.

BEALE (HELEN P.). **Relation of Stanley's crystalline Tobacco virus protein to intracellular crystalline deposits.**—*Contr. Boyce Thompson Inst.*, viii, 5, pp. 413–431, 6 figs., 1937.

The author states that by using Stanley's method she obtained crystalline tobacco virus protein [see preceding abstracts] from Turkish tobacco plants affected separately with ordinary tobacco mosaic and Holmes's [*R.A.M.*, xiii, p. 399] attenuated strain, from air-dried mosaic-diseased Turkish tobacco, from White Burley tobacco and *Petunia* sp. plants affected with ordinary tobacco mosaic, and also from *Solanum nigrum* var. *nodiflorum* affected with aucuba mosaic. It was further isolated from Turkish tobacco affected with streak (a combination of potato virus X and tobacco virus); the material

thus obtained appeared to be identical with that isolated from tobacco plants affected with the tobacco virus alone, and when inoculated into *Nicotiana glutinosa* plants produced local lesions characteristic of this virus, but not the systemic infection typical of potato virus X on this host.

A fully illustrated account is given of microscopic studies of the crystalline deposits associated with chlorosis and present in the living mosaic-diseased cells; by adding dilute sulphuric, hydrochloric, acetic, or nitric acid, or saturated magnesium sulphate solutions to the mounts of living diseased tissue, the crystalline plates were transformed into needles in all the hosts tested, namely, the Turkish and White Burley tobacco varieties, *Petunia* sp., tomato, *Capsicum* sp., and *S. nigrum* var. *nodiflorum*. It is suggested that the intracellular crystalline plates may be more complex in chemical composition than Stanley's crystalline tobacco virus protein, and it is concluded that these deposits are the source of the crystalline protein, firstly, because both compounds are present in large amounts; secondly, because of the striking similarity in the gross appearance of the needles precipitated in the cell and those isolated from virus extract; and thirdly, because the acidity and alkalinity at which Stanley reports denaturation of the protein corresponds closely to the reactions at either end of the P_H range at which the intracellular crystals go into solution and are not subsequently recrystallizable. It is further believed that the concentration of the crystallizable material is an important factor in the intracellular crystallization of tobacco virus protein.

SMITH (K. M.). **An air-borne plant virus.**—*Nature, Lond.*, cxxxix, 3513, p. 370, 1937.

The virus [of tobacco necrosis] found in the roots of apparently normal tobacco plants in an insect-proof glasshouse [*R.A.M.*, xvi, p. 419] having been observed in the roots of tobacco plants grown in autoclaved soil and watered only with boiled water, the glasshouse air was tested with an apparatus designed by J. P. Doncaster consisting of an electric pump connected by rubber tubing to gas-washing bottles containing a moist cotton-wool pad through which the air was drawn. The cotton-wool was tested for the virus by rubbing on the leaves of French bean (*Phaseolus vulgaris*), and in three separate experiments the virus was isolated from the pads. The smallest quantity of this air-borne virus reaching the soil seems capable of entering the roots of a plant growing therein.

HIRAYAMA (S.) & YUASA (K.). **Occurrence of inclusion bodies in the guard cells of the stomata of mosaic-tobacco plants.**—*Ann. phytopath. Soc. Japan*, vi, 4, pp. 305–306, 2 figs., 1937. [Japanese summary.]

Contrary to Miss Sheffield's statement that the cell inclusions typical of certain virus diseases do not occur in the guard cells of the stomata [*R.A.M.*, xvi, p. 67], the writers' renewed observations on fresh tobacco mosaic material mounted in acetocarmine definitely disclosed the presence of such bodies in the site in question [ibid., xv, p. 322]. After about an hour the structures are liable to obliteration under the

influence of the acetic acid, and it is thought that Miss Sheffield's cytological technique may possibly have induced this process at an earlier stage before the nature of the inclusions could be recognized.

Cochran (W. G.). **The statistical analysis of field counts of diseased plants.**—*J.R. statist. Soc., Suppl.*, iii, 1, pp. 49–67, 1 diag., 1936.

This is a discussion of the statistical analysis of the data obtained by the regular examination of every plant in a field or greenhouse for symptoms of a particular disease—in this case spotted wilt of tomatoes investigated by J. G. Bald at the Waite Institute, Australia [*R.A.M.*, xvi, pp. 134, 345, 497]. The analysis of the data at the first count (18th December, 1929, the 1,440 tomatoes having been planted out on 26th November) revealed a tendency towards a gradient of infection across the field and to the congregation of diseased plants in small patches. These results are both compatible with the transmission of the disease by *Thrips* [*tabaci*]. Patchiness would be explicable by the superior attractiveness or accessibility to the insects of certain sections of the field, or alternatively, to the migration of the viruliferous individuals to adjacent plants after feeding. In the second count (31st December) the indications of patchiness were very slight, and there was no pronounced irregularity in the distribution of the infection percentage over the field.

Berkeley (G. H.). **Prevention of virus diseases of greenhouse grown Tomatoes.**—*Circ. Dep. Agric. Can.*, 118, 7 pp., 7 figs., 1937.

Virus diseases of tomato, particularly common mosaic and single-virus and mixed-virus streaks, are stated to cause considerable losses throughout Canada, the first-named reducing the yield by up to 20 per cent. in the St. Catharines district of Ontario [*R.A.M.*, xvi, p. 348]. Other types of mosaic common on tomato are the yellow (aucuba), potato (mottle), and cucumber. Spotted wilt [see preceding abstract] has only been reported on one or two occasions. The common mosaic virus has been found to remain viable in the soil at St. Catharines for two to three months after harvesting. Recommendations for control include soil sterilization by steam or formaldehyde, crop rotation, strict plant sanitation, with disinfection of the hands and implements after handling infected plants, and frequent fumigation of the houses against insects.

Langford (A. N.). **The parasitism of Cladosporium fulvum Cooke and the genetics of resistance to it.**—*Canad. J. Res.*, xv, Sect. C, 3, pp. 108–128, 3 pl., 1 fig., 1937.

Four physiologic races of *Cladosporium fulvum* [*R.A.M.*, xvi, p. 70] were experimentally differentiated by differences in the pathogenicity of various cultures, while extensive cultural studies showed the presence of an indefinite number of such races. Saltant strains were isolated from cultures arising from single unicellular, uninucleate spores and are therefore regarded as due to mutations. Reaction to infection fell into four main classes, i.e., complete susceptibility, two types of partial resistance, and immunity. Reaction of pure lines of the host to the parasite is plastic and affected by environmental conditions. The

failure of Stirling Castle tomatoes to show inherent resistance to race 1 during midwinter at Toronto was found to be chiefly due to the plants receiving insufficient light at this time, while the inability of the same variety to support sporulation under the experimental conditions was due to the low relative humidity prevalent in the greenhouse. In addition to the dominant factor for immunity the red currant tomato (*Lycopersicum pimpinellifolium*) carries an independently segregating dominant factor which in the absence of the immunity factor governs resistance to the four races of *C. fulvum.* The resistance of Stirling Castle to races 1 and 3 was found to be due to another dominant factor. Among the genetic factors in the host modifying the reaction types is the recessive lutescence factor in the homozygous condition; this factor induces on genetically immune individuals the development of small infection spots which cease to enlarge soon after the symptoms appear. The conflicting reports concerning the reaction of tomato varieties to *C. fulvum* may be explained by failure to relate the results to specific physiologic races, and to the plasticity of the reaction between pure lines of the host and the parasite.

WRIGHT (E.). **Deciduous-seedling disease in midwest nurseries.**—*Plant Dis. Reptr*, xxi, 4, pp. 80–81, 1937. [Mimeographed.]

During the past two years *Rhizoctonia* [*Corticium*] *solani* has been isolated from the following deciduous seedlings attacked by root rot and damping-off in Federal nurseries in the middle-west states of North America; *Acer saccharinum*, *Catalpa speciosa*, *Ulmus pumila*, *U. americana*, *Chilopsis linearis*, *Robinia pseud-acacia*, *Caragana arborescens* (root rot only), and from seedlings of *Fraxinus pennsylvanica* var. *lanceolata* with top blight. Soil inoculation tests showed most isolates to be pathogenic. A *Pythium*, the specific identity of which has not yet been determined, was isolated from seedlings of *U. americana*, *U. pumila*, *C. speciosa*, and *R. pseud-acacia* affected by damping-off.

In a paragraph (p. 82) appended by B. S. Crandall, *Rhizoctonia* is stated to have been isolated during the past three years from seedlings of *R. pseud-acacia*, mimosa [*Leucaena pulverulenta*], hop hornbeam [*Ostrya* sp.], and tulip poplar [*Liriodendron tulipifera*].

KLEBAHN (H.). **Untersuchungen über Chondroplea populea (Dothichiza populea Sacc. u. Br.).** [Investigations on *Chondroplea populea* (*Dothichiza populea* Sacc. & Briard).]—*Z. PflKrankh.*, xlvii, 1, pp. 38–52, 6 figs., 1937.

Positive results were obtained in four out of twelve of the author's inoculation experiments in 1933 through wounds on *Populus alba*, *P. canadensis*, *P. italica*, and *P. robusta* with conidial suspensions of *Chondroplea* (*Dothichiza*) *populea* [*R.A.M.*, xvi, p. 5] from *P. robusta* branches at a Münster (Westphalia) nursery, where 1,500 three-year-old trees were killed by the fungus in 1933, but further experiments in 1934 and 1935 were entirely negative. This low percentage of successful inoculations is noteworthy in view of the severely parasitic character of the organism in nature and indicates that wounding is not the sole prerequisite condition for infection, some other factor, as yet unknown, being apparently involved. The fungus produces sunken, grey lesions

on the cortex, the presence on which of scattered protuberances, 1 to 2 mm. in diameter, provided with a small apical aperture, denotes the occurrence below the epiderm of conidial layers.

Pure cultures of *C. populea* from conidia were readily secured on salep or Sabouraud's agar; a fairly dense mycelium was produced, composed of hyphae 3·4 to 4·5 μ in diameter, with a few isolated swollen, thin-walled elements, 10 to 13 μ in diameter, resembling conidia but definitely distinct from them and possibly corresponding to Voglino's 'loculi' (*Ann. Accad. agric. Torino*, liii, 1910). Pycnidia containing long conidiophores are formed in conidial stromata. No connexion could be detected between *C. populea* and *Cenangium populneum* [*R.A.M.*, xv, p. 471] in comparative studies on herbarium material.

BEDWELL (J. L.). **Factors affecting Asiatic Chestnuts in forest plantations.**—*J. For.*, xxxv, 3, pp. 258–262, 1937.

In connexion with a survey from 1930 to 1933 of the Chinese and Japanese chestnut (*Castanea mollissima* and *C. crenata*) plantings established within the area bounded by New Hampshire, Texas, Iowa, and Florida, it is mentioned that neither species is absolutely immune from blight (*Endothia parasitica*) [*R.A.M.*, xv, p. 692], though both are highly resistant on good sites under favourable growing conditions. The disease does not usually attack trees under four years old, and in the plantings inspected by the writer deaths from blight occurred in nine localities, at only two of which did the mortality rate equal 0·5 per cent. of the total number planted.

KALSHOVEN (L. G. E.). **De ziekten en plagen van den Rasamala.** [Rasamala diseases and pests.]—*Tectona*, xxx, 3, pp. 162–176, 2 figs., 1937.

This is a compilation of the available knowledge concerning the fungal diseases and insect pests of 'rasamala' (*Altingia excelsa*), stated to be one of the most valuable trees of western Java. The following fungi have been observed: *Rigidoporus microporus* [*Fomes lignosus*] causing white root rot, damping-off (*Rhizoctonia*) [*Corticium solani*], a white, cobweb-like coating of the trunks (*Marasmius* sp.), and a die-back of the branches, accompanied by resin exudation, associated (possibly in a secondary capacity only) with *Diplodia* sp. and *Pestalozzia guepini*.

MEIER (K.). **Über eine durch Kalimangel bedingte 'Gelbsucht' an Thujapflanzen.** [On a 'yellowing' of *Thuja* plants induced by potash deficiency.]—*Landw. Jb. Schweiz*, li, 3, pp. 297–304, 4 pl. (2 col.), 1937. [French summary.]

A pathological condition of *Thuja* plants in Swiss nurseries manifested by zonate chlorosis, or in more severe cases by a reddish-brown to brown discoloration of the foliage and stunting or shedding of the young shoots, was ascertained by soil analysis to be due to a deficiency of potash, the content of which in the ash of affected material amounted to only 3·61 to 3·85 per cent. compared with 7·25 to 8·33 per cent. in that of healthy shoots. Experiments showed that the disturbance may be rectified by the application to the soil of appropriate quantities of

30 per cent. potash salt, while the development of the plants was also favoured by nitrogenous fertilizers.

HEPTING (G. H.) & DAVIDSON (R. W.). **A leaf and twig disease of Hemlock caused by a new species of Rosellinia.**—*Phytopathology*, xxvii, 3, pp. 305–310, 2 figs., 1937.

A leaf and twig disease of hemlocks (*Tsuga canadensis*), apparently identical with that recorded by H. H. Graves in 1914 (*Phytopathology*, iv, p. 63) as affecting three trees of the same species in the southern Appalachians, was prevalent in 1935 in coves in the Pisgah National Forest, North Carolina, causing up to 80 per cent. defoliation among trees under 15 ft. in height. The symptoms are generally similar to those induced on western conifers by *Herpotrichia nigra* and *Neopeckia coulteri* [*R.A.M.*, ix, p. 75]. The needle-bearing parts of the twigs become covered with a dense, greyish-brown mycelial mat in which perithecia are produced in abundance on the lower twig surfaces and leaf bases. After the death of the leaves the mycelium loses its felty, cobweb- or mould-like aspect and becomes flattened against the substratum, to the surface of which the perithecia appear to be glued.

The causal organism is a new species of *Rosellinia*, *R. herpotrichoides*, English and Latin diagnoses of which are given. The small, carbonaceous, rugose perithecia, embedded in the subiculum, are furnished with papillate ostioles, 0·5 to 0·9 mm. in diameter; the short-stipulate, cylindrical asci, 185 to 210 by 11 to 14 μ, with a thickened, gelatinous apical pore, contain eight uniseriate, dark brown, unicellular, ovate-oblong, inequilateral, sometimes slightly apiculate ascospores, 23 to 26 by 9 to 10 μ. No inoculation experiments were carried out, but the parasitic character of the fungus does not appear to be in doubt.

BAVENDAMM (W.). **Erkennen, Nachweis und Kultur der holzverfärbenden und holzzersetzenden Pilze.** [Recognition, detection, and culture of wood-staining and wood-destroying fungi.]—*Handb. biol. ArbMeth.*, Abt. XII, ii, 7, pp. 927–1134, 45 figs., 2 graphs, 1936.

An exhaustive critical survey, followed by a 15-page bibliography, is given of the available information on the macroscopic recognition of fungal diseases of wood on the living tree, felled logs, or structural timbers, the microscopic and chemical methods of detection of infection, and the isolation in pure culture of wood-staining and wood-destroying fungi.

RENNERFELT (E.). **Undersökningar över svampinfektionen i slipmassa och dess utveckling däri.** [Studies on the fungal infection of ground wood pulp and its development therein.]—*Svenska SkogsvFören. Tidskr.*, xxxv, 1, pp. 43–159, 12 figs., 1937. [English summary.]

This is an exhaustive, fully tabulated survey of the writer's studies on the fungal blueing of ground wood pulp in Swedish paper mills. The organisms isolated from the infected material were cultured on glucose or malt agar. The most frequent agents of blue stain, both in newly manufactured and stored pulp, are *Cadophora fastigiata* and *Pullularia pullulans* [*R.A.M.*, xv, p. 271]. Other organisms encountered were *Ophiostoma* [*Ceratostomella*] *piceae*, *Discula pinicola* [ibid., xiv, p. 274], *Phoma lignicola* n.sp. [with a Latin diagnosis], charac-

terized by a greyish-green to greenish-black mycelium, with hyphae up to 8 μ in diameter, round to oblong, dark brown pycnidia, 100 to 250 (usually 150 to 200) μ in diameter, furnished with one, two, or occasionally several ostioles, through which a large number of unicellular, hyaline, oval or slightly flattened, biguttulate spores, 3·5 to 5 by 1·8 to 2·2 μ, are discharged; *Alternaria humicola* [ibid., xii, p. 656; xiv, pp. 249, 270], *C. richardsiae*, *Cladosporium elatum*, *C. herbarum*, *Haplographium penicillioides*, *Oidiodendron fuscum*, *O. nigrum*, *Rhinocladiella atrovirens* [ibid., xiv, p. 275], *Stemphylium botryosum* [ibid., ix, p. 185], *S. macrosporoideum*, and *Trichosporium heteromorphum* [ibid., xiv, p. 275] (very common). There were also a number of Torulopsidaceae, namely, *Rhodotorula glutinis*, *R. mucilaginosa*, *R. gracilis* n.sp. [with a Latin diagnosis], forming round to ovate cells, 5 to 7 by 2·5 to 4 μ, singly or in groups of two to three, and assimilating glucose, maltose, saccharose, galactose, lactose, potassium nitrate, asparagin, ammonium sulphate, and urea; *Torulopsis stellata*, *T. aeria*, *Mycotoruloides* sp. A, *Geotrichoides* sp. A, and *Geotrichum candidum* [loc. cit; xv, p. 673]. Other fungi capable of inducing or increasing discoloration are *Aspergillus flavus*, *A. fumigatus*, *A. niger*, *Paecilomyces varioti* [ibid., xvi, p. 4], *Papulospora sphaerosperma*, *Penicillium amethystinum*, *P. corymbiferum*, *P. flavo-glaucum*, *P. rugulosum*, *P. viridiдorsum*, *Trichoderma koningi* [see above, p. 558], and *T. lignorum* [see above, p. 556].

Sources of infection include the wood itself, fresh water, the air, and the backwater, the last-named being the most important. Newly manufactured pulp from a closed system is more liable to blueing than that from an open one [ibid., xiv, p. 545], and the same applies to material prepared from fresh, as opposed to river-floated wood [ibid., x, p. 216]. Frozen pulp is more susceptible to staining after thawing than unfrozen [ibid., xv, p. 271]. The blueing fungi are in general more resistant both to high and low temperatures than the Torulopsidaceae, possibly on account of the low moisture content of their spores. In laboratory experiments only *Pullularia pullulans* and *Trichosporium heteromorphum* multiplied by budding during 48 hours at 1°, 20°, and 35°, chiefly at the medium temperature.

Discussing the problem of control, the writer alludes to Melin's statement that the Torulopsidaceae are capable of exerting an inhibitory action on the activities of the blueing fungi [ibid., xiv, p. 275]. This observation was confirmed to some extent by the writer's tests, but it has also been shown by various workers that the group in question may form mould-promoting substances, and, furthermore, the numbers of the Torulopsidaceae are depleted during winter storage, so that the utility of these organisms cannot be guaranteed. As regards hygienic measures, the main difficulty lies in the reduction of infection in the circulating backwater, the temperature of which should probably approach the upper critical limit, 45° to 50°, while sludge formation may be diminished by the substitution of iron pipes and sheets for copper ones and other technical improvements. Runbäck (*Skogen*, xx, 1933; *Svenska Flottledsförb. Årsb.*, x, 1936) has devised a method of watering or sprinkling stocks of wood which might be introduced into paper mills with advantage.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (East Sussex) Order of 1936. Dated October 29, 1936. No. 1165 of 1936.—4 pp., 1936.

This Order, effective as from 1st December, 1936, and concerned with the control of fungal diseases and insect pests of fruit in East Sussex, is on similar lines to those already issued to other local authorities [*R.A.M.*, xv, p. 831].

GRADOJEVIĆ (M.). **Yugoslavia: on the products used in the control of plant diseases and pests.**—*Int. Bull. Pl. Prot.*, xi, 3, pp. 51–52, 1937.

Any person desirous of manufacturing, introducing, or placing on the market an insecticidal or fungicidal product or the like must address to the Jugo-Slavian Ministry of Agriculture a special application, specifying the name of the preparation, describing in detail its properties, defining its active principle, stating whether it is or is not toxic to human beings and livestock, and indicating the method of use, dosage, and other particulars. Sufficient quantities of the product must be placed at the Ministry's disposal for chemical analyses and laboratory and field tests at two experiment stations at least. In the event of satisfactory results from such trials, a temporary permit is issued for the manufacture, import, or sale of the preparation in question, to be replaced by a permanent authorization after three to five years if practical evidence of the efficacy and utility of the treatment is forthcoming.

GOETZ (O.). **Das Reichspflanzenschutzgesetz.** [The Reich Plant Protection Act.]—*Obst- u. Gemüseb.*, lxxxiii, 3, p. 35, 1937.

The German 'Act for the Protection of Economic Agricultural Plants' of 5th March, 1937, falls into four parts, of which (1) empowers the Minister of Food and Agriculture to take the necessary measures [which are summarized] for (*a*) the control of diseases and pests of economic agricultural plants or parts or products thereof, (*b*) the prevention of their conveyance from one part of Germany to another or into the country from abroad or vice versa; (2) is concerned with the organization of plant protection, which is vested in the Biological Institute in co-operation with local plant protection bureaux, to be established by the Reich farmers' leader (Bauernführer) under the Ministry of Food and Agriculture, and with the inspection service, charged with the supervision of the import, transport, and export of plants and plant materials, of nurseries, horticultural, viticultural, and seed selection establishments, and with the provision of health certificates; (3) defines the duties and rights of the persons affected by the application of the regulations; and (4) deals with the expenses of administration, the imposition of fines or other penalties, and the dates of enforcement of the various provisions of the Act.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, October-December, 1936.—pp. 181–205, 1937.

Summaries are given of the plant quarantine import restrictions in force in Germany, Great Britain, Trinidad and Tobago, the Virgin Islands, Finland, and Bulgaria.

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KITAJIMA (K.). **Researches on the discolorations of logs of Fagus crenata Blume caused by Endoconidiophora bunae n.sp. and on its preventive method.**—Reprinted from *Bull. imp. For. exp. Sta.*, 35, 134 pp., 12 pl., 1936. [Japanese, with English summary. Received June, 1937.]

Endoconidiophora [*R.A.M.*, xiv, p. 729] *bunae* n.sp., the agent of a streaky, brown discoloration [cf. next abstracts] of the sapwood of freshly cut beech (*Fagus crenata*) [*F. sieboldii*] logs in the Shigetomi forest, Gokan, Japan, is characterized on soy agar, according to its English and Latin diagnoses, by brown hyphae, 4·5 to 6 μ in diameter; carbonaceous, globose perithecia, 104 to 243 μ in diameter, furnished with beaks 304 to 609 μ in length, covered with brown setae, 84 to 124 μ in length, and provided with ostioles surrounded by 7 to 21 hyaline filaments 10 to 63 μ long; reniform, hyaline ascospores, 3·9 to 4·8 by 2·2 to 4·3 μ; hyaline microconidiophores, 28 to 30 μ in length, with a basal diameter of 5 μ and tapering to the apex, producing endogenous, hyaline, cylindrical microconidia, 7 to 7·8 by 1·4 to 2·2 μ; and hyaline macroconidiophores, 63 to 70 by 7·2 to 8·4 μ, producing endogenous, hyaline, ovoid conidia, 8·4 to 14·4 by 7·2 to 9·6 μ.

The staining activity of *E. bunae* reaches a climax during the damp, warm weather of July and August, when infection may develop on the ends of the logs 7 to 10 days after cutting, seriously impairing the colour, texture, and clearness of the grain, though apparently not damaging the wood fibres. Inoculation experiments with the fungus gave positive results on its own host, *Quercus glandulifera, Zelkova acuminata, Magnolia hypoleuca,* and other timbers, *Pinus densiflora* remaining immune.

In experiments under controlled conditions no appreciable growth was made by *E. bunae* below 10° or above 30° C., the optimum temperature for development being about 26°. At or below a moisture content of 20 per cent. of the oven-dry weight of the wood there appears to be no risk of staining, but at or above 37 per cent. the mycelium grew vigorously, the wood was extensively discoloured, and numerous perithecia were formed. Properly air-seasoned or kiln-dried wood, therefore, should be impervious to infection from this source during storage.

Of the various media tested, soy, potato, and carrot were the best among the solid, and Peffer's and Currie's solutions the most suitable

liquids for the growth of *E. bunae*, which was found to require only a scanty supply of oxygen for its development. The use of Bavendamm's tannin technique [ibid., viii, p. 281] indicated that the fungus secretes some powerful oxidizing ferments. In mixed cultures the mycelium of *E. bunae* overgrew that of all species of *Ceratostomella* tested except *C. pilifera* [ibid., xvi, p. 358], whereas *E. bunae* in its turn was overrun by the mycelia of various other wood-destroying fungi included in the tests.

Various standard timber preservatives having proved ineffectual against the brown stain induced by *E. bunae*, the writer formulated a number of preparations for coating the ends of the logs, of which the following (the proportions being given by weight) proved the best adapted for the purpose: (No. 18) denatured alcohol 26, rosin 48, slaked lime 4, aspest powder 10·5, and coal-tar creosote 10 [totalling 98·5]; (No. 24) wood tar 69, pine pitch 26, and slaked lime 5. The costs of the treatments are 20 and 14 cents, respectively, per cu. m. Directions are given for their application at various seasons. *F. sieboldii* trees should not be felled in July, when the cortex, which provides a certain protection against the entrance of wood-staining and wood-destroying fungi, is most easily detachable.

GOIDÀNICH (G.). **Le alterazioni cromatiche parassitarie del legname in Italia. IV. I parassiti del legno di conifere.** [Parasitic staining of timber in Italy. IV. The parasites of conifer wood.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 4, pp. 225–270, 3 col. pl., 37 figs., 1937.

A detailed account with Latin diagnoses is given of the author's comprehensive study of the morphology and taxonomy of the chief staining fungi attacking conifers [see preceding abstract] in Italy and of the nature of the injury produced [cf. *R.A.M.*, xv, pp. 129, 412; xvi, p. 5].

Ophiostoma piliferum (syn. *Ceratostomella pilifera* and *C. coerulea* [ibid., xiv, p. 702; xv, p. 185]) [a revised description of which is given] is stated to be one of the most injurious of staining fungi, spreading in the medullary rays and resin ducts and, to a lesser extent, in the tracheids.

Graphium silanum n.sp. isolated from *Pinus sylvestris* has hyphae 1·5 to 6 (usually 2·5 to 3) μ in diameter. The rigid coremia measure 370 to 680 by 45 to 90 μ and widen out at the top to 190 to 240 μ broad. The colourless, almost cylindrical, round-ended conidia measure 3·5 to 4·8 by 1·7 to 2·4 μ and arise singly or in groups of 2 or 3 at the tip of the synnematous hyphae. Secondary, oval conidia, attenuated at the base, 4·5 to 7 by 2·5 to 4 μ, are borne on spicules at the apex of the primary conidia, and these in turn bear others. The fungus produces irregular, chestnut-grey, elongated spots penetrating the wood to a considerable depth.

From *P. pinea* the author isolated a fungus which he identified from its cultural characters as *G. penicillioides* [ibid., x, p. 71], but which he regards as the coremial form of *O. piceae* (Münch) Nannf. Sclerotia were developed in culture. The fungus causes spotting of a not very intense blue.

Grosmannia ips [ibid., xv, p. 827] was found on the bark (only) of

P. pinea, its first record in Europe. *G. serpens* [loc. cit.] causes a rather deep blue spotting of the wood of *P. pinea*, mostly at the periphery of the trunk. *Sphaeropsis ellisii* var. *chromogena* [ibid., xv, p. 412] was again isolated from *P. pinea* in 1936. *Trichoderma lignorum* and *T. koningi* [ibid., xvi, p. 575] are considered by the author to have some significance in the etiology of timber staining, though causing only a superficial discoloration without affecting the anatomical structure of the wood; the latter has been recorded on wood pulp, but has not been found associated with timber diseases.

Fusicoccum tingens n.sp. was isolated from the wood of *P. pinea*, in which it produced long, deep, narrow, olive-green spots spreading from the periphery towards the centre of the woody cylinder. In culture the mycelium was very dark green to black and the surface of the colony smooth and shining, later becoming covered by a black aerial mycelium of irregular, toruloid cells. Finally large, light grey, scattered masses of closely packed hyphae are formed, sometimes bearing a drop of yellowish liquid at the top. Fructifications are not produced readily either on artificial media or on wood. Only in very old cultures on malt agar has it been possible to obtain fertile pycnidiferous bodies which allowed the author to identify the parasite. These bodies are fairly large and covered with grey mycelium. The rounded loculi were lined with hyaline, cylindrical sporophores, 9 to 25 by 2·3 to 3·5 μ, slightly tapering at the apex where they bore hyaline pycnospores, 20·5 to 24 by 6 to 7 μ, at first cuspidate but becoming regularly fusiform when free. Artificial infection experiments showed the fungus to be of exceptional virulence and activity.

GROTH (H.). **Förekomsten av 'dowicide'—utslag i Finland och möjligheterna att förebygga uppkomsten av detsamma.** [The occurrence of 'dowicide' eruption in Finland and the possibilities of preventing its development.]—*Papp. Trävarutidskr. Finl., 1937*, 4, pp. 126–128, 1937. [German summary.]

The use of dowicide [*R.A.M.*, xvi, p. 428] for the control of 'blueing' of timber [*Ceratostomella* or *Ophiostoma* spp. and other fungi: ibid., xvi, p. 74, and preceding and next abstracts] is stated to have saved the Finnish industry at least M. 60,000,000 annually, but is attended by one disadvantage in the form of a mild dermatitis affecting 173 out of 1,039 workmen in 26 sawmills under the writer's inspection. The disturbance may be reduced to a minimum by the adoption of appropriate prophylactic measures, such as the wearing of rubber gloves, the application of grease to the hands and arms, and the like.

SAHLMAN (E. J.). **Discoloration of timber logs.**—*Papp. Trävarutidskr. Finl., 1937*, 5, p. 159, 1937.

Of various storage methods tested in Finland in 1936 the two giving the best control of staining in pine logs [*Ceratostomella* or *Ophiostoma* spp. and other fungi: see preceding abstracts] were stacking (*a*) in overlapping rafts and (*b*) in piles continually sprinkled with water (Runbäck's method); in these two lots the incidence of discoloration was only about 5 per cent., compared with 8·5 and 74 per cent. for open rafts and dry piles, respectively.

HAHN. **Erfahrungen mit Holzimprägniermitteln.** [Experiences with timber preservatives.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 13, pp. 140–141, 1937.

Excellent results are reported by a nurseryman at Hagen, Westphalia, in the preservation of the woodwork of glasshouses and frames by immersion for 4 to 12 hours in a 20 per cent. solution of antorgan [*R.A.M.*, xv, p. 479]. It is estimated that the durability of Thuringian pine wood is increased by 22 to 25 years by the treatment.

SCHEFFER (T. C.) & LIVINGSTON (B. E.). **Relation of oxygen pressure and temperature to growth and carbon-dioxide production in the fungus Polystictus versicolor.**—*Amer. J. Bot.*, xxiv, 3, pp. 109–119, 4 graphs, 1937.

In experiments described in this paper *Polystictus versicolor* [*R.A.M.*, xvi, p. 139] was grown for five days on malt agar strips in special culture tubes through which water-saturated gas flowed continuously at the rate of 15 l. a day, at oxygen pressures maintained at 0, 1·5, 10, 16, 37, 115, 152, 381, and 745 mm., and at temperatures of 17·5°, 21·5°, 25·5°, 29·5°, and 33·5° C. The minimum oxygen pressure for mycelial growth was found to be between 1·5 and 10 mm. for all the temperatures. For a pressure range of 37 to 745 mm. the growth rate showed little or no effect of the pressure at any temperature, while for each oxygen pressure the optimum and maximum temperatures were about 29·5° and 35°, respectively. Carbon dioxide production per unit area of mycelial mat at oxygen pressures ranging from 0·0 to 745 mm. and at all temperatures tested was in general more rapid, but decreasingly so, as the oxygen pressure rose, and was two to five times as fast with almost pure oxygen as under anaerobic conditions. No minimum, optimum, or maximum oxygen pressure was observed for carbon dioxide production at any temperature. Growth was most rapid for combinations of 29·5° with oxygen pressures of 15 to 745 mm. Carbon dioxide production was most rapid per mat unit at combinations of 33·5° and 745 mm., and slowest at those of 17·5° and 0 mm. pressure. An index of growth efficiency in relation to carbon conservation was obtained by dividing the growth rate for any temperature-oxygen combination by the corresponding rate of carbon dioxide production per unit of mat area. Growth took place with relatively the least loss of carbon when the pressure was near the minimum permitting growth, temperature having very little effect in this connexion. Loss of carbon was relatively most rapid at combinations of 17·5° and 33·5° with 745 mm. pressure. For each oxygen pressure over 15 mm. the coefficient of growth efficiency was greatest for 25·5°.

The data obtained indicate that decay by wood-destroying fungi may be more rapid the more completely the wood is aerated, provided that its water content is sufficient for the requirements of the fungus. The optimum temperature for decay probably lies above the optimum but much below the maximum for mycelial growth. For time intervals and wood zones involving a limited range of decay stages, destruction of wood is probably slowest in proportion to the spread of infection

when low oxygen pressure is accompanied by temperatures below the optimum for fungal growth.

Peters (F.), Krieg (W.), & Pflug (H.). **Toximetrische Prüfung von Steinkohlenteerimprägnieröl nach der Klötzchenmethode.** [The toximetric testing of coal tar impregnation oil by the wood-block method.]—*Chemikerztg*, lxi, 26, pp. 275–278, 1 diag., 1937.

Details are given of experiments carried out by the standardized wood-block method [*R.A.M.*, xvi, p. 503] to disprove Bateman's contention that coal tar impregnation oil consists largely of non-toxic materials which merely serve as carriers of the fungicidal principle [ibid., v, p. 398]. The fungi used in the tests were *Coniophora cerebella* [*C. puteana*], *Polyporus vaporarius* [*Poria vaporaria*], *Lenzites abietina* [ibid., xvi, p. 292], and *Lentinus squamosus* [ibid., xv, p. 623]. The resultant data clearly showed that most of the ten constituents of the impregnation oil used by the German State Railways and Postal Service are of a high degree of toxicity and none can be regarded as non-fungicidal in Bateman's sense, though certain high-boiling components [ibid., xvi, p. 78], e.g., the after-run of neutral oil and anthracene expressed residue, exert a relatively weak action on *P. vaporaria* and *L. squamosus*.

British Standard specifications for coal tar creosote for the preservation of timber. (Types A, A2 and B.) (Revised July 1936.) No. 144—1936.—17 pp., London, British Standards Institution, 1936.

British Standard type A creosote [cf. *R.A.M.*, xvi, p. 430] consists essentially of a distillate of coal tar free from any admixture of petroleum or similar oils. The specific gravity of the material at 38° C. compared with water at 20° may not be lower than 1·010 or higher than 1·065. The material must become completely fluid on gradual warming to 38° with stirring, and on cooling remain completely fluid after two hours' standing at 15·5°. The distillates of 100 gm. of dry material at 205°, 230° C., and 315° may not exceed 6, 40, and 78 gm. respectively, and the residue must be soft and not sticky. The material must contain not less than 5 or more than 16 per cent. by volume of tar acids, and must not yield more than 0·4 per cent. by weight of matter insoluble in benzole.

The specific gravity of creosote type A 2 may not be lower than 0·995 or higher than 1·065. When creosote from low temperature tar is ordered, the specific gravity may not be lower than 0·935 or higher than 1·065. The material must become completely fluid on gradual warming to 38°, and on cooling remain completely fluid after two hours' standing at 32° or at 15·5° if required for brush applications. The distillates may not exceed 6, 40, and 85 gm. respectively at 205°, 230°, and 315°. At least 5 per cent. by volume of tar acids must be present.

The specific gravity of creosote type B (from coal tar made in Scotland) may not be lower than 0·995 or higher than 1·065. When creosote from blast furnace tar is ordered, the specific gravity may not be lower than 0·935 or higher than 1·065. The fluidity, water content, distillation, tar acid, and benzole-insoluble matter requirements conform to those given for A 2.

Bertrand (G.) & Silberstein (L.). **Nouvelles déterminations de la teneur en bore de plantes cultivées sur le même sol.** [Further determinations of the boron content of plants cultivated on the same soil.]—*C.R. Acad. Sci., Paris*, cciv, 13, pp. 1019–1021, 1937.

In further analyses of the boron content of ten cultivated plants and four weeds grown continuously in the same plot [*R.A.M.*, xvi, p. 81], meadow grass [*Poa pratensis*], like the other Gramineae, was found to be extremely poor in this element (3·1 mg. per kg. of dry matter), while the onion, with only 4·3 mg., resembled the leek. The relatively high boron content of various Leguminosae was again manifested to a varying extent by broad bean [*Vicia faba*] (16·5 mg.), lucerne (28·9), and bird's foot trefoil [*Lotus corniculatus*] (36·6). Other determinations include flax (7·1 mg.), celery (11·9 and 15), potato (13·9 and 15), and tomato (15 and 19).

Koopman (C.). **Invloed van mangaansulfaatbespruiting tegen kwaadhartigheid bij Schokkererwten.** [The influence of manganese sulphate spraying on marsh spot of Schokker Peas.]—*Tijdschr. PlZiekt.*, xliii, 3, pp. 64–66, 1937.

Miss Löhnis's studies having indicated a correlation between manganese deficiency and marsh spot of peas in Holland [*R.A.M.*, xv, p. 767], the writer treated plots of Jumboka Schokkers (coarse-seeded) and Zelka Schokkers (fine-seeded) with a solution of 1 per cent. manganese sulphate, the first application being made just after the close of flowering, and the second about three weeks later. In one test the incidence of the disorder was reduced from 27·75 and 8 per cent. in Jumboka and Zelka, respectively, to 6 and 0·75 per cent., respectively, while the corresponding figures in another trial were from 32·5 and 11 to 10·25 and 0·5 per cent., respectively. The extreme susceptibility to marsh spot of the Jumboka variety renders it particularly suitable for use in control experiments with manganese sulphate, the use of which may possibly result in increased yields, but in this respect the present data, though suggestive, are not altogether convincing.

Ovinge (A.). **Kwade harten in Schokkers.** [Marsh spot in Schokker Peas.]—*Tijdschr. PlZiekt.*, xliii, 3, pp. 67–73, 1937.

The beneficial effect of manganese sulphate on Schokker peas affected by marsh spot [see preceding abstract] was demonstrated in tests in Zealand in 1935–6, in which the compound was applied to the soil between the rows at the rate of 100 or 200 kg. per hect., somewhat better results being obtained with the double quantity. In a test to determine the correct time for the manganese sulphate treatment (100 kg.), a healthier stand was secured by applying the compound just as the plants were about to flower than when they were only about 10 cm. in height. Further experiments are necessary to ascertain the influence of the treatment on yield, but a tendency to enhanced productivity is indicated by the fresh green foliage and late ripening (ten days or so after the controls) of the plants given 200 kg. manganese sulphate per hect.

STAPP (C.). **Der bakterielle Stengelbrand der Erbsen.** [The bacterial stem blight of Peas.]—*Zbl. Bakt.*, Abt. 2, xcvi, 1–4, pp. 1–17, 7 figs., 1937.

In June, 1934, the progeny of a cross between Schurig's Early and Grünbleibende Schnabel peas, growing in sandy soil, were observed to be affected by a disease corresponding in external and internal symptoms to the bacterial stem blight (*Pseudomonas pisi*) occurring in the United States [*R.A.M.*, ix, p. 700; xii, p. 263; xiii, pp. 3, 76], both parents remaining healthy. The organism isolated from the vascular bundles, parenchymatous tissue, and pith of diseased plants differed in certain respects from that originally described by W. G. Sackett (*Bull. Colo. agric. Exp. Sta.* 218, 1916) as *P. pisi*. The average dimensions of the seven German strains subjected to intensive study were 1·2 to 2·2 by 0·6 to 1 μ, 1 to 1·8 by 0·6 μ, and 1·2 to 2 by 0·5 to 0·7 μ on bouillon, potato, and carrot agar, respectively, compared with 1·11 to 3·28 by 0·58 to 0·82 μ for the American specimens, while the latter was reported to be uniflagellate and the number of flagella in the German strains ranges from 1 to 5. Sackett mentions no involution forms, which were highly characteristic of the writer's material. A number of other physiological and biochemical deviations from the type were observed, but are not considered sufficiently important to raise any doubts as to the identity of the German organism. The results of serological experiments indicated a relationship between *P. pisi*, *P.* [*Bacterium*] *medicaginis* var. *phaseolicola*, and *P. tabaci* [*Bact. tabacum*].

None of the 37 varieties inoculated with potato agar suspensions of *P. pisi* proved to be immune from infection, but a fair degree of resistance was shown by Heine's Folger and Victoria, Kortstroo Schokker 2517, Meyer's Friedeburg Victoria, Nordost small white, Strube's early Victoria, and Werther's Jena Victoria, while Pluk, Nordost early green and P.S.G. large yellow hybrid were among the most susceptible.

The control measures recommended by various workers are briefly indicated.

STUBBS (M. W.). **Viroses of garden Pea.**—*Phytopathology*, xxvii, 3, pp. 242–266, 3 figs., 1937.

In this amplified, tabulated account of the writer's studies in Wisconsin during 1933–4 on pea viruses, a condensed version of which has already appeared [*R.A.M.*, xv, p. 551], peas and sweet peas are newly recorded as susceptible to tobacco ring spot, which infected more or less severely all 34 varieties of the former used in inoculation tests, causing top necrosis of the seedlings with occasional rings on the leaflets not killed and a conspicuous brown discoloration of the stem. Host range experiments revealed important differences between pea virus 1 (enation mosaic) [ibid., xvi, p. 517] and the other three mosaic viruses distinguished as 2A (marble), 2B (speckle), and 2C (mild). The first-named infects peas (including Perfection), crimson clover (*Trifolium incarnatum*), broad beans (*Vicia faba* var. *minor*), Midwest soybeans, sweet peas, and yellow sweet clover (*Melilotus officinalis*), but not red clover (*T. pratense*), garden beans (*Phaseolus vulgaris*), or white lupin (*Lupinus alba*). The other three attack peas (excluding Per-

fection), *T. incarnatum*, *V. faba* var. *minor*, *M. officinalis*, and *L. alba*, but not *T. pratense*, *P. vulgaris*, or soy-beans. In seed transmission tests 3 questionable cases of infection occurred in 13,328 seedlings.

WELLMAN (F. L.). **Control of southern Celery mosaic in Florida by removing weeds that serve as sources of mosaic infection.**—*Tech. Bull. U.S. Dep. Agric.* 548, 16 pp., 4 figs., 1937.

Southern celery mosaic [*R.A.M.*, xv, p. 191] is stated to have been satisfactorily controlled in the Sanford district of Florida by the complete eradication of all weeds for a distance of 75 ft. or more round the seed-beds before planting and by the removal of weeds, especially *Commelina nudiflora*, from a similar radius round fields, beginning before transplanting and repeating about five times during the growing season. Inoculation experiments on over 10,000 celery plants, comprising 77 varieties or strains, gave positive results in every case, and no resistance to mosaic was shown by any of the standard varieties used locally or comparable foreign types.

NELSON (R.) & LEWIS (R. W.). **Comparative effectiveness of copper dusts in the control of Celery leaf blights in 1936.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xix, 3, pp. 159–162, 1 fig., 1937.

In a further comparative test carried out in Michigan in 1936 on the control of early blight (*Cercospora apii*) and late blight (*Septoria* spp.) [*S. apii* and its var. *graveolentis*] [*R.A.M.*, xv, p. 552] Michigan Golden celery dusted at the rate of 40 lb. per acre per application on 2nd, 9th, 16th, 22nd, and 27th July with copper sulphate-lime (standard 20–80) and two commercial dusts, one containing 7 per cent. red copper oxide and the other 7 per cent. basic copper sulphate, each dust supplying equivalent quantities of copper, showed, respectively, 94·5, 72·4, and 78·5 per cent. control, taking the amount of disease present on the untreated plots as equivalent to 0 per cent. control.

THORNBERRY (H. H.) & ANDERSON (H. W.). **Comparative studies on cultures of Phytomonas lactucae-scariolae, n.sp. and Phytomonas pruni.**—*Phytopathology*, xxvii, 1, pp. 109–110, 1937.

From the oily exudate issuing from angular, light brown lesions, 2 to 4 mm. in diameter, on wild lettuce (*Lactuca scariola*) leaves in Illinois the writers isolated a rod measuring 1 to 1·5 by 0·5 to 1 μ, motile by 1 or 2 polar flagella, occurring mostly in pairs, non-spore-forming, Gram-negative, non-acid-fast, forming round, entire, finely granular, amber-yellow colonies on dextrose agar, liquefying gelatine, reducing nitrates, peptonizing litmus milk, producing no gas from any of the sugars tested, aerobic, and with minimum, optimum, and maximum temperatures and hydrogen-ion concentrations of 7°, 25°, and 35° C. and P_H 4·8, 7·5, and 11, respectively. Positive results were obtained in inoculation experiments with pure cultures of the organism, which is named *Phytomonas lactucae-scariolae* n.sp., on healthy wild lettuce plants, whereas the morphologically, biochemically, and culturally identical *P.* [*Bacterium*] *pruni*, a pathogen of the peach [*R.A.M.*, xv, p. 235], failed to attack *L. scariola*.

Pizer (N. H.). **Improvement of Mushroom composts. II.**—*Gdnrs' Chron.*, ci, 2620, p. 174, 1937.

Experiments at the South-Eastern Agricultural College, Wye, Kent, are stated to have shown that the cropping of mushrooms [*Psalliota* spp.: *R.A.M.*, xvi, p. 365] may be expedited and yields raised by the addition to the compost heap, during the final turning of the manure, of 14 lb. superphosphate per ton, mixed with an equal quantity of gypsum. A successful modification of this treatment consists in the dusting of 28 lb. of ground gypsum into each ton of manure as the first heap of compost is being made, while at the last turn the manure is again sprinkled with a mixture of equal parts by weight of ground gypsum and superphosphate at the rate of 28 lb. per ton.

De Guerpel (H.). **Les ennemis et les maladies du Soja.** [The pests and diseases of the Soy-bean.]—*Rev. Bot. appl.*, xvii, 187, pp. 195–201, 1937.

After pointing out that soy-beans in France have so far remained free from infection the author gives brief notes on the following diseases of this crop reported from Europe and America, viz., bacterial blight (*Bacterium glycineum*) [*R.A.M.*, xv, p. 632], *Bact. phaseoli* [var. *sojense*: ibid., xiii, pp. 210, 564], *Bact. sojae* [ibid., xiv. p. 87], a wilt (recorded from Japan in 1926) attributed tentatively to *Rhizobium beijerinckii* [*Pseudomonas radicicola*], mosaic [ibid., xiv, p. 82], leaf spot probably due to potash deficiency [ibid., xiii, p. 209], rust (*Aecidium glycines* R. Heim) [ibid., i, p. 207], *Cercospora cruenta* [ibid., xvi, p. 492], *Cercosporina kikuchii* [ibid., ix, p. 23], *Fusarium tracheiphilum* [ibid., xi, p. 88], *Glomerella cingulata*, browning of the roots caused by *Corticium vagum* [*C. solani*] (in India by a *Rhizoctonia* and in Trinidad by *Sclerotium rolfsii* [ibid., xiii, p. 540]), *Sclerotinia libertiana* [*S. sclerotiorum*: ibid., xi, p. 316], *Septoria glycines* [ibid., xi, p. 88], *Peronospora manschurica* [ibid., xv, p. 632], *Phyllosticta* [*Pleosphaerulina*] *sojaecola* [ibid., xi, p. 89], *Uromyces sojae* [ibid., vi, p. 74], and *Erysiphe communis*. The control measures recommended are seed disinfection and, if an outbreak should occur, spraying with Bordeaux mixture.

Maier (W.). **Bormangelerscheinungen an Rebsämlingen in Wasserkulturversuchen.** [Boron deficiency manifestations in Vine seedlings in water culture experiments.]—*Gartenbauwiss.*, xi, 1, pp. 1–16, 10 figs., 1937.

The absence of boron from the nutrient solution (v. d. Crone's) in which vine seedlings were grown led to abnormal developments of various kinds, involving the death of the growing point of the shoot, the formation of short internodes, and small leaves, strongly rolled downwards and at first dark green but becoming yellow at the edges and between the veins, with petioles frequently swollen in the middle, while the production of lateral shoots was another conspicuous feature of the deficiency. The amount of boron (0·6 mg. per l. of nutrient solution) necessary to combat these disturbances was found to be contained in an aluminium-zinc solution (1 c.c. per l.) in which traces of numerous other elements are also represented; none of these, however,

was capable of taking the place of boron as an essential constituent of vine growth.

Arnaud (G.). **Action de divers métaux sur le mildiou de la Vigne.** [The action of various metals on Vine mildew.]—*C.R. Acad. Agric. Fr.*, xxiii, 2, pp. 64–67, 1937.

In this note (preceded by some introductory remarks by D. Bois) the writer states that good control of *Plasmopara viticola* on the susceptible Carignane vines was obtained in 1936 by five applications of 1 per cent. nickel sulphate, which equalled copper sulphate in efficacy. Silver sulphate at the same concentration caused such severe scorching as entirely to preclude its use for this purpose, and cobalt sulphate afforded only a slight degree of protection.

Kramer (O.). **Erfahrungen aus dem Peronosporajahr 1936.** [Experiences of the *Peronospora* year 1936.]—*Nachr. SchädlBekämpf., Leverkusen*, xii, 1, pp. 18–25, 4 figs., 1937. [English, French, and Spanish summaries on pp. 42–43, 46–47, 50–51.]

Peronospora [*Plasmopara viticola*] is stated to have been responsible for an almost unprecedented epidemic of downy mildew in Württemberg vineyards in 1936, the untreated test plots at the Weinsberg Experiment Station being practically defoliated by September and yielding not a single sound fruit. Where spraying was carried out on the dates recommended by the Experiment Station authorities, however, losses were negligible. If strictly followed the regulation schedule of five applications (at the most) of 1 per cent. nosprasen neutral or 1 to 1·5 or 2 per cent. (for final treatments) nosprasen [*R.A.M.*, xiv, p. 79], corresponding to the standard 1 to 1·5 per cent. Bordeaux mixture, should be ample for local conditions. A number of useful practical directions for spraying procedure are given.

Negrul (A. M.). Генетические основы селекции Винограда. [Genetical bases of Vine breeding.]—*Bull. appl. Bot. Select., 1936*, Ser. viii, 6, 150 pp., 16 figs., 1936. [English summary. Received June, 1937.]

This is a summarized and fully tabulated report of the work done in U.S.S.R. from 1928 to 1935, inclusive, in the development of new vine varieties by inter- and intraspecific hybridization, in an attempt to breed new types combining the best commercial qualities, together with adequate resistance to the more important diseases, pests, and adverse ecological factors. It also includes a detailed discussion of the genetical principles underlying the researches. It is shown, *inter alia*, that variations in resistance to mildew (*Plasmopara viticola*) occur both between vine species and between varieties of the same species, and that resistance is inherited. In crosses between resistant and susceptible forms inheritance of resistance is polymerous in character. While in general resistance is recessive in the F_1, various combinations of the parents and different crosses of one and the same combination give varying types of resistance in F_1 seedlings, and a different type of segregation in F_2, non-resistant forms being predominant in every case;

in breeding mildew-resistant varieties, therefore, the selection of the parent pairs is of great importance.

Koudelka (H.). **Vorläufige Mitteilung über die Entstehung der Markkrankheit der Weinrebe.** [Preliminary note on the origin of the pith disease of the Vine.]—*Nachr. SchädlBekämpf., Leverkusen*, xii, pp. 25–35, 11 figs., 1937. [English, French, and Spanish summaries on pp. 43–44, 47–48, 51–52.]

From vines affected with pith disease sent for inspection from Retz, Austria, to the Tetschen-Liebwerd (Czecho-Slovakia) Plant Nutrition Institute in the autumn of 1935, the writer isolated on an appropriate culture medium two fungi differing from *Pumilus medullae* [*R.A.M.*, xvi, p. 229] and here referred to as A and B, and two bacteria (I and II). Fungus A is a very rapid grower with a faintly reddish-yellow mycelium composed of exceptionally slender hyphae and producing two kinds of fructifications, namely, spherical to elongated, verticillate conidia and small, globular chlamydospores, developed in series and capable of immediate germination. Inoculations with this organism or bacterium I on the cut surfaces of healthy stocks of *Riparia portalis* gave positive results in the form of retarded growth, and weak shoots with short, thin, translucent shoots producing pale yellowish foliage. The effects of joint infection by fungus A and bacterium I were particularly noticeable, a marked feature being necrosis of the apical shoots. Characteristic of fungus A was a pronounced curtailment of growth, and of bacterium I a black foliar discoloration. An examination of the pith of vines inoculated with both organisms revealed an almost black discoloration of the nodes. Immediately above the 10th and 13th nodes was a very conspicuous constriction where the excentric distribution of the brownish-black, powdery pith involved its exposure. These symptoms agree with those observed in nature.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1936.** [Review of phytopathological records noted in 1936.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 1–78, 4 figs., 1937.

This report [cf. *R.A.M.*, xv, p. 774] contains numerous items of interest, of which the following may be mentioned.

About 30 Verhanca vines grafted on Riparia Portalis in Trieste were affected by a bacterial disease resembling 'mal nero' [ibid., xiii, pp. 422, 492], and followed by secondary infection by a *Diplodia*, a *Macrosporium*, and an *Acremonium*. The affected branches were short, the internodes cracked, and the pith was brown and dead. The young shoots had short, hairy internodes which showed tobacco-coloured spots beneath which the cambium was necrosed and the lysigenous cavities were full of bacteria. The young leaves often bore dry, reddish, interveinal spots. The condition had appeared each spring for four or five years, the growth of the shoots becoming arrested after the emission of a few small leaves. Two bacterial organisms were constantly isolated from the diseased material, one cocciform and 0·5 to 0·6 μ in diameter, and the other truncated at the polar extremities, measuring 2·5 to 4 by 1·4 to 2 μ and arranged in chains.

Malvasia bianca vines (resistant to leaf roll) [ibid., xiv, p. 679],

grafted on to affected Negro amaro vines themselves grafted on American stocks, in no instance showed the presence of endocellular cordons [see below, p. 622], though these were found in the American stocks and the Negro amaro vines on them, and were beginning to appear in the Negro amaro vines on Malvasia bianca. Apparently, the last-named variety inhibits the pathogenic action of the virus on the embryonal tissues, but allows it to pass through them.

Olives at Messina have for some years shown a withering and brown discoloration of the branches, the condition being associated with a *Cytospora*, probably *C. oleina*, with hyaline, curved, irregularly shaped spores measuring 4 to 4·5 by 1·5 to 2 μ; *C. elaeina*, which is probably identical with *C. oleina*, was also present.

Young Bergamotta Espérèn pears grafted on quince showed a necrosis of the bark that developed at the site of the graft and spread upwards and downwards. The cortical tissues contained a saprophytic *Sporotrichum* and a *Phytophthora* which on carrot agar formed piriform, papillate zoosporangia measuring 35·5 to 43·5 by 27 to 37 μ, and round, yellowish, smooth-walled oogonia with paragynous antheridia. The spheroidal oospores had a smooth, thick, yellow wall, and measured 23 to 26 μ in diameter.

Apples were infected in the trunk and bases of the large branches by *Fusarium solani* var. *eumartii*; the affected bark became detached in strips and complete or localized withering supervened.

Apricots were severely infected by *Monilia* [*Sclerotinia*] *laxa* [ibid., xv, p. 233]. The most serious walnut disease in Italy is the root rot caused by a *Phytophthora* closely allied to *P. cambivora* [ibid., xv, p. 774]. New physiologic races of *Puccinia triticina* found in Italy [ibid., xvi, p. 89] were numbered 84, 85, and 86, according to Humphrey, Johnston, and Caldwell's revised classification (1936) making a total of 11 new physiologic races of this fungus in Italy.

Young *Sorghum saccharatum* plants showed a reddish leaf spot resembling that generally attributed to *Bacillus sorghi* [ibid., xi, p. 696].

UPPAL (B. N.). **Appendix K. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1935–36.**—*Rep. Dep. Agric. Bombay, 1935–36*, pp. 203–207, 1937.

This report [cf. *R.A.M.*, xv, p. 482] contains, among others, the following items of interest. The seed of the homozygous strain D–IX of sann hemp [*Crotalaria juncea*] resistant to wilt [*Fusarium vasinfectum*: loc. cit.] was multiplied during the year. In newly planted gardens of betel vines [*Piper betle*] one sulphur application of about 50 lb. per acre effectively controlled powdery mildew [? *Oidium* sp.: ibid., xv, p. 78], but in old gardens two applications at an interval of about 1½ months were required, the total dressing amounting to about 90 lb. per acre. The cost amounted to 6 to 8 rupees per acre. Histological studies demonstrated that the fungus causing mango powdery mildew has globular haustoria and should be referred to *Erysiphe polygoni* [ibid., xv, p. 482]. The pathogenicity of a species of *Phoma* isolated from black spots on the stem end of ripe Alphonso mangoes was established on fruits of the same variety. *Oidiopsis taurica* [ibid., xv, p. 683] was found on *Cajanus indicus* [*C. cajan*], apparently for the first time

in India. Bordeaux mixture (3–3–50) applied at intervals of one month from November to February both gave control of fig rust [*Cerotelium fici*: ibid., xv, p. 778], while sulsol ($2\frac{1}{2}$ and 3 in 100) was effective but caused leaf-bronzing. Viable uredospores were collected throughout the year, indicating that in the Deccan *C. fici* perpetuates itself in the uredo stage.

In tests of the progeny of B.D. 8–6 and 8–26 cotton plants for resistance to *F. vasinfectum*, only 38 out of 710 plants survived for 45 days; of these, 26 showed no leaf mottle, and were transplanted to an infected plot for testing. Strains of new selection 12 tested in 1933–5, yielded 51 free from mottle out of a total population of 1,000 plants.

Numerous isolations from the diseased roots of 'mosambi' [orange] gave a *Fusarium* sp., the pathogenicity of which is to be tested.

CONNERS (I. L.). **Sixteenth Annual Report of the Canadian Plant Disease Survey, 1936.**—xi+88 pp., 1 map, 1937. [Mimeographed.]

In 1936, wheat stem rust [*Puccinia graminis*] caused only slight damage in western Canada [cf. *R.A.M.*, xv, p. 631]. As it appeared a week earlier than in 1935, and the weather favoured the disease during the last two weeks of June, enough inoculum was present in Manitoba to produce a severe epidemic, but subsequently all the cereal crops in the south of Manitoba ripened prematurely and the rust made little progress. It appears that the new rust-resistant variety Thatcher may be more susceptible to ergot (*Claviceps purpurea*) [ibid., vi, p. 406; xii, p. 275] than the bread wheat varieties commonly grown in western Canada.

Lucerne growing at Windermere, British Columbia, appeared to be affected by bacterial wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*: ibid., xvi, p. 104], a new record for Canada. Pea leaf spot (*Cladosporium pisicola*) [ibid., xiv, p. 71] was present in British Columbia, and rhubarb leaf spot (*Ramularia rhei*), apparently a new record for North America, was found at High River, Alberta.

Pucciniastrum epilobii, already recorded in Alaska on *Godetia* and *Clarkia*, now occurs on *Godetia* across Canada from Alberta to Prince Edward Island, and was recently observed on *Clarkia* in a greenhouse at Ithaca, New York. *Coleosporium campanulae* [ibid., xiii, p. 813] was found on *Campanula persicifolia* in Vancouver, the first Canadian record of the fungus. A leaf spot new to North America, *Gloeosporium mezerei* [ibid., vi, p. 597], caused heavy defoliation of *Daphne mezereum* in British Columbia. Stocks (*Matthiola* sp.) in Ottawa and Quebec were severely affected by foot rot due to *Fusarium avenaceum*. A new apple rot observed in New Brunswick was caused by *G. allantoideum* Peck, for which Dearness has erected the genus *Dasycarpoma*. Red raspberries in Ontario were affected in 1935 by what appeared to be a new virus disease, and was tentatively named 'yellow blotch'.

Applications of boron against apple drought spot and corky core [ibid., xvi, pp. 42, 325] are estimated to have increased the harvest in the Okanagan valley in 1936 by 40,000 boxes of perfect fruit. A yellowing of lucerne, common in patches and entire fields in the Okanagan and Kootenay valleys, was also ascertained to be due to boron deficiency.

Cephalosporium wilt of elms [ibid., xvi, p. 504] was observed in Nova Scotia, this being the first record of the disease in Canada.

The willow scab fungus (*Fusicladium saliciperdum*) [*Venturia chlorospora*: ibid., xiv, p. 479] caused heavy infection in the maritime provinces of Canada and eastern Quebec, and was more destructive in the Annapolis valley, Nova Scotia, than since 1928; it now occurs as far west as Louiseville, Quebec.

BOURIQUET (G.). **Madagascar: list of the parasites and diseases of cultivated plants.**—*Int. Bull. Pl. Prot.*, xi, 4, pp. 66–68, 1937.

The following are among the records comprised in this continuation (extending to November, 1936) of the writer's list of Madagascan plant parasites and diseases [*R.A.M.*, xiii, p. 618]: *Bacterium albilineans* on sugar-cane [ibid., xvi, p. 562], *Alternaria tabacina* on tobacco [ibid., xiii, pp. 278, 804], *Bacterium phaseoli* on French beans [*Phaseolus vulgaris*: ibid., xvi, p. 441], and *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., xv, p. 422; xvi, p. 153] on gherkins [*Cucumis* sp.].

BURKHOLDER (W. H.). **Serological reactions for the determination of bacterial plant pathogens.**—*Phytopathology*, xxvii, 4, pp. 572–574, 1937.

The writer views with some misgiving the growing tendency among plant pathologists to use the serological reactions of a bacterium as a quasi-infallible criterion of its specific identity. It has yet to be shown, in the genera *Erwinia* and *Phytomonas*, that serological characters are definitely correlated with biological properties, and pending convincing proof of such an association, it would seem wiser to rely on the more stable physiological features as a basis for bacterial plant pathogen classification.

BOIVIN (A.), MESROBEANU (LYDIA), MARBÉ (M.), JUSTER (P.), & SĂVULESCU (T.). **Sur la production de tumeurs chez la plante, au moyen de l'endotoxine non protéique du B. tumefaciens.** [On the production of plant tumours by means of the non-proteinic endotoxin of *Bacterium tumefaciens*.]—*Arch. roum. Path. exp. Microbiol.*, x, 1, pp. 67–78, 4 figs., 1937.

The authors isolated from *Bacterium tumefaciens* a glucidolipidic endotoxin capable of inducing in sunflower (*Helianthus annuus*) plants tumours comparable with those resulting from inoculation with the living organism [*R.A.M.*, xvi, p. 370], the sole difference being that the neoplasms arising from the endotoxin involved less of the primary cortex and caused a more pronounced hyperplasia of the central tissues than did the bacterium itself.

ARK (P. A.). **Effect of certain enzymes and amino-acids on crown gall tissues.**—*Science*, N.S., lxxxv, 2206, p. 364, 1937.

The rapid destruction of the galls induced on *Pelargonium zonale*, tomato, and sunflower (*Helianthus annuus*) by *Phytomonas* [*Bacterium*] *tumefaciens* [see preceding abstract] was effected by the injection of a mixture of *Erwinia carotovora* strains. Inferring from this phenomenon that enzymes or other specific compounds might be involved in the elimination of overgrowths, the writer introduced into tumours 3 to 5 cm. in diameter, produced on *P. zonale* and sunflower by a rose strain of

Bact. tumefaciens, a 0·1 per cent. aqueous solution or crystals of diastase, papain, pepsin, cysteine hydrochloride, leucine, isoleucine, tryosine, and tryptophane. In all cases except those of the plants treated with the two last-named substances, the galls gradually collapsed, shrivelled, and remained as hard vestiges readily detachable from the host. The action of papain and pepsin was specially prompt, while the time required for the mummification of the galls by the other compounds used ranged from ten days to a fortnight.

CONNER (H. A.), PETERSON (W. H.), & RIKER (A. J.). **The nitrogen metabolism of the crown gall and hairy root bacteria.**—*J. agric. Res.*, liv, 8, pp. 621–628, 1937.

A brief account is given of biochemical studies of the nitrogen metabolism of *Phytomonas* [*Bacterium*] *tumefaciens*, a pathogenically attenuated sister culture of this organism, and of *P.* [*Bact.*] *rhizogenes* [*R.A.M.*, xvi, p. 191] in eight different nutrient media [the composition of which is indicated]. The results indicated that in media containing glucose and yeast infusion, approximately one-fourth to one-third of the total nitrogen was converted into cellular proteins. Both strains of the crown gall organism decreased amino nitrogen, but no decrease was observed in the case of the hairy root bacterium, indicating that it utilized and formed amino nitrogen at approximately the same rates. All the organisms slightly reduced the amount of ammonia nitrogen, and utilization of ammonia occurred in media to which ammonium salts were added. In similar media, except for glucose, large amounts of ammonia were formed, and protein nitrogen increased to about the same degree as in the presence of glucose. Both strains of the crown gall bacterium were able to utilize ammonium nitrate as the sole source of nitrogen in glucose-containing media, and ammonia nitrogen was more available than nitrate nitrogen. All the organisms readily utilized the polypeptide and amino nitrogen of peptone, resulting in an increase in cellular proteins and ammonia, while the fraction precipitated by tungstic acid was less readily available.

STAPP (C.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. V. Mitteilung. Der Einfluss von T.S.-Hormon (Follikel-Hormon) auf Tumorbildung und Gesamtentwicklung der mit Pseudomonas tumefaciens infizierten Wirtspflanzen.** [Crown gall of plants and its agent *Pseudomonas tumefaciens*. Note V. The influence of T.S. hormone (follicle hormone) on tumour formation and the general development of host plants infected by *Pseudomonas tumefaciens*.]—*Zbl. Bakt.*, Abt. 2, xcvi, 5–8, pp. 81–92, 1 fig., 1 diag., 1937.

Continuing his studies on crown gall of plants (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xvi, p. 302], the writer describes and tabulates the results of two years' experiments on tomatoes to determine whether oestrogenic substances of animal origin exert analogous effects on plants to those following the introduction of these elements into the human or animal body.

In 1934 plants of seven varieties (including Bonny Best and Ailsa

Craig) were grown in pots in the greenhouse, and two plants of each sort (a) treated with T.S. hormone solution (at first incorporated with the soil and later diluted with double its volume of water and applied at the rate of 30 c.c. per plant), at the rate of 1,000 mouse units (10 c.c.) weekly for nine weeks, (b) as in (a) supplemented by inoculation with the dahlia strain of *Bact. tumefaciens*, (c) inoculated with the latter only, and (d) left untreated for control purposes. On an average, the hormone-treated, uninoculated plants were slightly taller and larger than those receiving both treatments. Tumour formation was somewhat more conspicuous and the fruits generally heavier in the plants to which hormone was applied than in the controls.

In 1935 the experiment was carried out in the open on Lucullus plants receiving 500 mouse units of hormone diluted to 50 c.c. by admixture with 2 per cent. hakaphos for the first three weeks, 1,000 for the second three, and 1,500 for the last three, with and without supplementary inoculation with the dahlia or *Chrysanthemum frutescens* II b strain of *Bact. tumefaciens*. As in the case of the greenhouse plants, the hormone-treated individuals were taller than the controls, but contrary to the results of the 1934 tests the fruits were lighter and tumour formation slightly arrested. In neither year did the hormone treatment expedite flowering.

HARDY (F.). **Marginal leaf-scorch of Cacao. Its relationship to soil potash deficiency. (With a note on the ecology of Cacao thrips).**— *Rep. Cacao Res., Trin., 1936*, pp. 13–24, 1 col. pl. [frontispiece], 1937.

Cacao in Trinidad, Tobago, and Grenada is widely affected by a crenulate, marginal leaf scorch, which appears near the apices of the mature leaves and spreads inwards towards the midrib and backwards towards the petiole along the margin. The affected parts become purplish-grey-brown, membranous, and brittle. The inner borders of the dead areas are lined with darker, purplish-brown pigment, and small, darker brown patches appear within them. Affected leaves fall prematurely, but as young leaves are not affected, the condition becomes most conspicuous towards the end of the wet season.

Sand culture tests, soil and manurial investigations, and chemical analyses of leaf material [which are fully described, and the results tabulated] indicated that the condition is due principally to a deficiency of available potash, or to some disturbance of the nutritional balance, particularly with regard to intake of potassium, calcium, and nitrogen. An unsatisfactory soil structure and atmospheric exposure are contributing factors. The limiting values of available potash for soils of different textures supporting healthy cacao free from leaf scorch were ascertained provisionally to range from 100 to 175 p.p.m. exchangeable potash. The chief analytical features differentiating susceptible from non-susceptible cacao leaves were a high nitrogen-potash ratio, a low potash-lime ratio, a high total ash content, a low soluble ash and total base content, and a low gross nitrogen and potash content.

Control measures recommended consist in suitable manuring, mainly with potash salts, and the improvement of soil structure by the judicious encouragement of natural herbaceous weed growth.

Sibilia (C.). **Ricerche sulle ruggini dei cereali. VII. Lo svernamento di Puccinia graminis tritici Erikss. et Henn. e di Puccinia triticina Erikss. in Italia.** [Researches on cereal rusts. VII. The overwintering of *Puccinia graminis tritici* Erikss. & Henn. and *P. triticina* Erikss. in Italy.]—*Boll. Staz. Pat. veg. Roma,* N.S., xvii, 1, pp. 147–164, 1 fig., 1937.

Continuing his studies on cereal rusts [*R.A.M.*, xvi, p. 89] the author, in December, 1936, after a succession of nights when the temperature had dropped to −7° C., found self-sown wheat at Rieti bearing *Puccinia graminis* pustules with germinable uredospores. At the same time, he found in another field numerous pustules of both *P. graminis* and *P. triticina* on volunteer wheat, and on wheat sown early in October, but none on plants sown between the end of October and early November. Mentana wheat sown early in October showed *P. graminis* pustules with uredospores injured by the cold, Rezza wheat sown at the same period showed withered pustules of *P. graminis,* a hard wheat (284/1926) showed pustules produced by the same fungus, and a soft one (539/1932) showed open uredosori of *P. triticina* in excellent condition with well-developed teleutospores.

On 7th February, 1937, volunteer wheat at Salerno showed numerous *P. graminis* pustules, though on 25th February they were not found on cultivated wheat in the same locality. In 1933, 1935, and 1936 pustules of both rusts were found on wheat (sown between November and February) when the temperature was below freezing and snow was prevalent.

Uredospores collected during the winter of 1936–7 from apparently rusted wild Graminaceous plants were sown on the Michigan Bronze and Strube's Dickkopf wheat varieties, the former being susceptible to *P. triticina* and the latter to *P. graminis*. Infection by *P. triticina* was produced on Michigan Bronze by material collected at Alessandria on 12th December, and identified as physiologic race LVII [ibid., xv, p. 83]. Other pustules of both fungi were produced on both wheats by material collected at Salerno on 25th February, 1937. Uredospores collected on 23rd February, 1937, from a wild Graminaceous host in an experimental field near Rome yielded on Michigan Bronze wheat three or four small *P. triticina* pustules, and in 120 similar tests with material from this field four positive infections were obtained. Thousands of apparently healthy wheat seedlings collected from different localities during winter and kept in a glasshouse at 20° for about 20 days failed to develop uredosori, indicating that under Italian conditions the mycelium of either rust does not overwinter in the tissues of plants showing no symptoms of infection.

It is concluded that *P. graminis* and *P. tritici* occur rather frequently in northern and central Italy in the uredo stage on self-sown and early sown wheat, and less commonly on wheat sown at the usual time. The overwintering of these rusts on wild Graminaceous hosts is of importance throughout Italy in view of the fact that slightly over 3 per cent. of infection tests with material collected from such hosts in winter gave positive results. Masked autumn infections on wheat sown on the usual dates either do not occur, or, if they do, produce uredosori during the course of the winter.

WICKENS (G. M.). **Smut disease of Wheat in Southern Rhodesia.**—*Rhod. agric. J.*, xxxiv, 4, pp. 271–276, 1937.

The quality of the flour milled from Rhodesian wheat in 1936 is reported to have been much impaired by 'smut', and in future considerably lower prices will be paid for affected samples. As loose smut [*Ustilago tritici*], while it reduces yield, is unlikely to affect flour quality, it is assumed that bunt [*Tilletia caries* and *T. foetens*] was responsible [*R.A.M.*, xv, p. 208; xvi, p. 28; cf. also xvi, pp. 239, 374]. Control of the latter disease is recommended by seed dusting in a machine with copper carbonate, agrosan G, or new ceresan; with regard to loose smut, it is pointed out that much of the wheat in Rhodesia flowers at a period when atmospheric humidity is low, a condition unfavourable to infection of the flowers. Where irrigation is practised, water should be withheld as much as possible during flowering, and if infection should be present to any appreciable degree at this stage the seed taken from the crop should be subjected to the hot-water treatment or discarded, other seed being obtained from a clean crop.

SANDU-VILLE (C.). **Tratarea seminței de Grâu contra mălurei.** [Wheat seed treatment against bunt.]—*Anal. Inst. Cerc. agron. Român.*, viii, pp. 501–518, 1936. [French summary. Received July, 1937.]

In seed treatments of wheat against bunt (*Tilletia tritici* [*T. caries*] and *T. foetens*) carried out in Rumania from 1931 to 1936, inclusive, the best results were given by wet treatments with Schloesing's mixture, formalin, germisan, higosan [*R.A.M.*, xiv, p. 499], a preparation made by Professor Nițescu in Rumania, copper sulphate, and uspulun universal. Dust applications were less efficacious, especially in dry autumns, though ceresan reduced infection to some extent. When one and the same preparation can be used either as a dust or a fluid it is more fungicidal in the latter form—synaf, for example, when used as a 1 per cent. solution, giving only 6·7 per cent. bunted ears, as against 54·1 per cent. when used as a dust. It was also found that plots watered in autumn gave a lower percentage of bunt than unwatered plots. No infection whatever developed in plots sown with seed treated with uspulun universal, higosan, germisan, or formol solutions.

GRODSINSKY (L.). **Manifestación foliar del Ustilago tritici.** [Foliar symptoms of *Ustilago tritici*.]—*Rev. argent. Agron.*, iv, 1, pp. 71–72, 1937.

A wheat plant occurring in the F_1 of Kooperatorka × 38 M.A. was found with smut sori on both surfaces of the superior leaf blade, causing it to rupture longitudinally. The spike enclosed by the sheath was also attacked by the smut, which was identified on the basis of the size of the chlamydospores and the germination and growth in culture as *Ustilago tritici* [*R.A.M.*, xv, p. 84], not hitherto reported in this form from the Argentine.

HANNA (W. F.). **Physiologic forms of loose smut of Wheat.**—*Canad. J. Res.*, Sect. C, xv, 4, pp. 141–153, 1937.

In this account of continued investigations on loose smut (*Ustilago tritici*) of wheat in Manitoba [*R.A.M.*, xi, p. 443], the author states that

in the course of greenhouse inoculations with the two races of the smut previously differentiated two additional races appeared. Spores from light infections on certain varieties inoculated with the original loose smut collections were used to inoculate the variety from which they had come, and the spores thus produced were tested on 13 varieties of wheat. In this manner the two new races were obtained. One, which gave 87 per cent. infection on Renfrew, while the first inoculation had only produced 4 per cent. infection on this variety, differed from the two original races in its reaction on the Ceres and Preston wheats; the other differed from the second original form in its reaction on Pentad, Mindum, and Khapli. The former race probably originated as an impurity in the parent collection on the Reward variety, the latter as a mutation from the parent strain, as it does not attack Reward, from which the original collection was made. The inoculation of Reward, Garnet, Marquis, and Pentad×Marquis with their own spores to four generations, did not result in increased infection by loose smut on these varieties, the first three of which were susceptible and the last moderately resistant. A physiologic race to which Pentad×Marquis was susceptible would probably have been purified and increased by such procedure. Still further experiments with Reward wheat, healthy plants of which are sometimes found in populations grown from artificially infected seed, showed that repeated selection through several generations from these healthy plants did not increase their resistance to loose smut, and their presence signifies accidental escape from infection rather than inherent resistance.

WESTERN (J. H.). **Sexual fusion in Ustilago avenae under natural conditions.**—*Phytopathology*, xxvii, 4, pp. 547–553, 1 pl., 1937.

In the course of studies on sporidial production by *Ustilago avenae* in nature, oat grains enclosed in their glumes were inoculated by means of Allison's vacuum pump (*Tech. Bull. Minn. agric. Exp. Sta.* 119, 1936) with suspensions of (*a*) chlamydospores and (*b*) mixtures of two sporidial lines of different sexes in distilled water, 2 per cent. malt solution, and 2 per cent. potato dextrose solution. After several hours' drying the grains were placed on moist filter paper in Petri dishes and left to germinate at temperatures of 0°, 5°, 10°, 20°, 25°, and 30° C. For subsequent examination the material was mostly stained with lactophenol and cotton blue, but Bismarck brown, gentian violet, and Gram's iodine were also used in particular instances. Besides the mature grains treated as described above, some oat florets were dusted with chlamydospores while still on the plant.

The smut spores were found to germinate and the promycelia to grow almost as rapidly in distilled water as in nutrient solutions. At 0° germination was almost entirely inhibited, at 5° and 10° germination took place without sporidial production but accompanied by the formation of looped fusion tubes uniting contiguous mycelial segments, while at 20° and 25° there were a few sporidia, gemmae, and numerous fusion tubes closely resembling the fused sporidia of artificial cultures and frequently giving rise to true infection hyphae. The inoculation of two monosporidial lines of unlike sex between the oat glumes resulted at 25° in the development of fusions indistinguishable from those occurring

in culture, and the initial penetration of the host was shown to be accomplished by means of infection tubes piercing the epidermal wall in an exactly similar manner to those arising from chlamydospores [*R.A.M.*, xv, p. 711]. At 30° no sporidia were formed, germination was reduced, promycelial contortion was common, and fusions were not apparent.

The course of flower infection was observed on the susceptible Anthony variety. Spore germination was found to commence about twelve hours after dusting the young stigmas, normal promycelia developed, and a few sporidia were formed, followed shortly by fusions between adjoining mycelial segments and occasionally by the apparent inception of a multiseptate mycelium. Stigma penetration was invariably effected by direct entry of the promycelium.

Discussing the bearing of these data on physiologic specialization in *U. avenae*, the writer suggests that the observed constancy of certain races of the smut may be explained by the predominance in nature of the restricted types of sexual fusion here described [cf. ibid., xvi, p. 446].

GERRETSEN (F. C.). **Manganese deficiency of Oats and its relation to soil bacteria.**—*Ann. Bot., Lond.*, N.S., i, 2, pp. 207–230, 4 pl., 1937.

This is a full account of the author's investigations into the relationships between manganese deficiency, soil bacteria, and grey speck of oats, other versions of which have already been noticed from different sources [*R.A.M.*, xvi, p. 92].

HEDLUND (T.). **Om Havrens gråfläcksjuka som en av orsakerna till ohälsosamt hö.** [On the grey speck disease of Oats as one of the causes of unwholesome hay.]—*Landtmannen, Uppsala*, xxi, 16, pp. 375–376, 1 fig., 1937.

Grey speck of oats [see preceding abstract], timothy [*Phleum pratense*], and other fodder grasses, is among the diseases adversely affecting the quality of the hay produced by the crop, the unwholesomeness of which is reflected in its ill effects on domestic animals. The chemical metabolism of the disease is discussed in relation to E. Hiltner's studies in Germany [*R.A.M.*, iv, p. 275] and to a concurrent series of experiments at Alnarp, Sweden. The primary cause of the whole trouble lies in the shortage of sugar in the leaves, the first symptom of which (developing long before the characteristic foliar spotting) is a marked lowering of resistance to frost. A necessary concomitant of the lack of sugar is deficiency of the acids forming the bases of sodium and potash salts.

SPRAGUE (R.). **Fusarium poae on spring Oats in Oregon.**—*Plant Dis. Reptr*, xxi, 5, pp. 87–88, 1937. [Mimeographed.]

Fusarium poae [*R.A.M.*, xiv, p. 720] has been observed on the panicles of spring oats in Oregon, causing a buff discoloration and sterility of the affected organs. In some cases the fungus appears to be a secondary parasite on spikelets, already rendered sterile by smut (*Ustilago levis*), 5 per cent. of which was observed at the John Jacob Astor Experiment Station on a variety reputed to be Markton [ibid.,

xvi, p. 309]. Cultures of *F. poae* produce tufted, buff-coloured colonies on potato dextrose agar, with abundant production of *Sporotrichum* like conidia [ibid., xi, p. 647] at 35° to 40° C.

STEVENS (N. E.). **Third experimental forecast of the incidence of bacterial wilt of Corn.**—*Plant Dis. Reptr*, xxi, 6, pp. 102–107, 1 graph, 1 map, 1937. [Mimeographed.]

The successful development by plant breeders of maize varieties combining excellent quality with a satisfactory degree of resistance to bacterial wilt [*Aplanobacter stewarti*: *R.A.M.*, xvi, p. 449], has seriously handicapped the writer's studies on the relation of winter temperatures to outbreaks of the disease in the following season [ibid., xv, p. 573]. However, data are forthcoming to show that, as was to be expected from the relatively low (92) winter index for Washington, D.C., in 1935–6, the losses from maize wilt in that area were decidedly reduced in the following summer for the first time in recent years. Reports from other districts tend to bear out the hypothesis of a relationship between a comparatively severe winter and a decline in the severity of *A. stewarti*. On the basis of the high winter temperature indices for 1936–7 on the eastern seaboard, there should be a noticeable increase of bacterial wilt on susceptible maize varieties in the area between northern Virginia and southern Connecticut early in the growing season of 1937.

PEGLION (V.). **Presenza della Nematospora coryli nel Granturco cimiciato.** [The presence of *Nematospora coryli* in insect-infected Maize.]—Reprinted from *Mem. R. Accad. Bologna*, Ser. IX, ii, (*1934–35*), 5 pp., 1935. [Received July, 1937.]

Maize seed in Italy that appeared to have deteriorated in the ear as a result of insect infestation and that after a few days in the laboratory developed a copious growth of *Oospora verticillioides* (? *Gibberella moniliformis*) [*R.A.M.*, xii, p. 505] constantly showed the presence of *Nematospora coryli* within the tissues [ibid., xv, p. 719]. The asci were least common in the aleurone layer, but abundantly present in the embryo, which contained up to 30 per cent. fat as against up to 4·5 per cent. in dry maize ears.

TAKASUGI (H.) & AKAISHI (Y.). **Studies on the smuts of Sorghums. (Second report.) Germination and infection power of the loose kernel smut (Sphacelotheca cruenta (Kühn) Potter) of Sorghum and its prevention.**—*Res. Bull. S. Manchuria Rly Co.* 16, pp. 49–75, 1937. [Japanese, with English summary.]

In a test to determine the infective capacity of *Sphacelotheca cruenta* [*R.A.M.*, xvi, p. 377 and next abstract] spores in soil at varying distances from sorghum seeds, no smut developed beyond 7·5 cm. when both were on the same level, while the corresponding limits when the seeds were below or above the spores were 12·5 and 10·5 cm., respectively. In a dry state the spores retained their viability for four years. The maximum germinative and infective capacity was shown by spores overwintered in a moist chamber in which a uniformly high temperature

was maintained day and night, whereas those laid on the surface of the soil, either directly or in smutted sorghum ears with various kinds of protective coverings, completely lost their viability. *S. cruenta* spores require about 18 days to mature after the emergence of the diseased ear from the sheath, and maintain 35 per cent. of their infective capacity until the following year. Eight of the 68 sorghum varieties of which the seed was inoculated before sowing with *S. cruenta* spores showed a fair degree of resistance.

The incidence of loose kernel smut was found to be promoted by the heavy piling-up of soil over the seed, and by a deficiency of potassium and phosphoric acid in the fertilizer. Infection may be arrested by the prompt removal of diseased ears. The most effective of the various methods of seed treatment tested was sprinkling with a dilute solution of formalin.

MARCY (D. ELIZABETH). **Inheritance of resistance to the loose and covered kernel smuts of Sorghum. I. Dwarf Yellow Milo hybrids.** —*Bull. Torrey bot. Cl.*, lxiv, 4, pp. 209–228, 2 pl., 2 graphs, 1937.

This is a full report of the author's studies [a reference to which has already been noticed from another source: *R.A.M.*, xv, p. 642] of the inheritance in sorghum of resistance to *Sphacelotheca sorghi* and *S. cruenta*, this issue dealing with hybrids between the two resistant varieties Dwarf Yellow Milo and Feterita, and between the first-named and the susceptible varieties Dakota Amber Sorgo, Shallu, and Dawn Kafir, and their reciprocals. Inoculation experiments [by a method which is briefly described] with the two resistant varieties showed that when germinated under environmental conditions favouring heavy infection of susceptible varieties, Feterita may also become infected with *S. sorghi*, but not Milo, indicating that the two varieties differ genetically from one another; there was no reason to believe that the infection of Feterita was due to a different physiological race of the smut. No difference, however, was observed between the two varieties in respect of *S. cruenta*. The four susceptible varieties represented widely different types of sorghum, also differing in their degree of susceptibility. Their reaction to the two smuts corresponded closely, a variety giving high infections with one smut tending to give high infections with the other, though percentage infection with *S. cruenta* was always lower. There was evidence that in the hybrids between Dwarf Yellow Milo and the susceptible varieties resistance to *S. sorghi* may be governed by a single factor, and reaction to *S. cruenta* by more than one.

Annual Report of the Veterinary and Agricultural Department, British Somaliland, for 1936.—20 pp., 1 graph, [1937. Mimeographed.]

In 1936 sorghum in British Somaliland was affected by *Tolyposporium filiferum* [*T. ehrenbergii*: *R.A.M.*, xv, p. 829], *Sphacelotheca sorghi* [ibid., xvi, p. 377], which in some cases produced 100 per cent. infection in the second crop, *S. cruenta* [see preceding abstract], *Sorosporium reilianum* [ibid., xvi, p. 377], and *Cladosporium herbarum*. Copper sulphate was issued free for control purposes.

ARRUDA (S. C.). **Myriogenospora aciculisporae Vizioli sobre Milho.** [*Myriogenospora aciculisporae* Vizioli on Millet.]—*Biologico*, iii, 2, pp. 75–76, 1 fig., 1937.

A very brief account is given of a diseased condition of an unspecified millet in the Botanic Garden of Cantareira, São Paulo, caused by a fungus which is referred to *Myriogenospora aciculisporae* [*R.A.M.*, xiii, p. 706], in spite of the fact that the maximum length of its spores was found to be 34 instead of 25 μ, as indicated in Vizioli's diagnosis.

GONÇALVEZ (R. D.). **Cerebella andropogonis Cesati parasitando Claviceps sp. sobre varias Gramineas.** [*Cerebella andropogonis* Cesati parasitizing *Claviceps* sp. on various Graminaceous plants.]—*Biologico*, iii, 2, pp. 74–75, 1937.

The fact that *Cerebella andropogonis* [*R.A.M.*, xi, p. 544] was found inside inflorescences of three grasses (*Hyparrhenia rufa*, *Tricholaena rosea*, and *Panicum barbinode*) from various localities in the States of Rio de Janeiro, São Paulo, and Minas Geraes, its mycelium surrounding compact masses of small, unicellular spores, resembling those of the *Sphacelia* stage of a species of *Claviceps*, induces the author to believe that it was actually parasitizing the last-named organism, and not the higher plant host. In support of this view he refers to several records of *Cerebella* species parasitic on ergot-producing fungi [ibid., viii, p. 34].

WARDLAW (C. W.) & LEONARD (E. R.). **Antiseptic and other treatments in the storage of Trinidad Citrus fruits.**—*Mem. Low Temp. Res. Sta., Trin.*, 5, pp. 3–23, 13 graphs, 1937.

Further investigations into the storage of Trinidad grapefruit [*R.A.M.*, xv, p. 495 and next abstract] showed that the fungi mainly responsible for wastage are (in descending order of importance) *Botryodiplodia theobromae*, *Colletotrichum gloeosporioides*, and *Penicillium digitatum*.

Grapefruit immersed for 20 seconds in 8 per cent. boric acid solution at 100° F., after 40 days' storage at 76° showed 87·5 per cent. wastage due to *B. theobromae* and *C. gloeosporioides* as against 12 per cent. in the undipped controls. Other grapefruit scrubbed with a spore suspension of *P. digitatum* and similarly dipped and stored showed 94 per cent. total wastage (all three organisms) as compared with only 10 per cent. wastage in the controls. When grapefruit after being submitted to different quailing periods were dipped in 7 per cent. boric acid solution at 100° for about 15 seconds and stored at (*a*) 45° for 66 days, and (*b*) 45° for 20 days, followed by 60° for 12 days, minimum wastage (7·8 and 0 per cent., respectively, for long and short storage) occurred in the undipped controls given 24 hours' quailing, whereas the dipped fruit even after short storage showed upwards of 28 per cent. wastage. Similar results were also obtained in other experiments. Treatment in water at 100° for 20 seconds, however, did not increase wastage, and in fruit stored at 45° immediately after dipping and later held at 60°, the injurious effects of the borax were masked or delayed. The author concludes that the borax dip for Trinidad grapefruit should be discontinued.

Waxing of grapefruit was definitely beneficial in reducing loss of weight during storage and decreasing the rate of blemishing and fungal wastage.

Grapefruit placed in iodized wraps prepared according to Tomkins's formula [ibid., xv, p. 702; xvi, p. 311 and below, p. 621] and applied approximately three days after picking, after 15 days' storage at 80° showed 32 per cent. wastage due to *B. theobromae*, as against only 5 per cent. wastage in the fruits in untreated wraps; by the 39th day both lots showed approximately equal amounts of wastage, the iodine promoting infection by *B. theobromae*, and failing to control *C. gloeosporioides*. When oranges were placed in plain and iodized wrappers (*a*) within 24 hours of picking, and (*b*) after 4 days' storage at tropical temperatures, 20 days at 45°, and 1 day at 60°, in lot (*a*) the iodized wraps controlled wastage by *B. theobromae* and *C. gloeosporioides*, whereas in lot (*b*) they promoted wastage. When oranges were scrubbed with a suspension of *P. digitatum*, wrapped in plain or iodized wrappers, and held at 78° and 60°, definite control of *P. digitatum* resulted at both temperatures, especially at the higher one, but the fruit in the iodized wraps developed a high percentage of infection by *B. theobromae*. It would appear that when infection is still superficial iodine vapour curtails spore germination and hyphal growth, but when the interval between picking and wrapping allows hyphal penetration, or where latent infections are present, it lowers resistance to fungal attack.

In an appendix entitled 'Mycological Notes on Citrus Wastage' (pp. 24–27) by R. E. D. Baker [ibid., xvi, p. 395] the author states that inoculations of Marsh grapefruit, Valencia oranges, lemons, T1 limes, *Citrus aurantifolia*, Kusai limes, and Rangpur limes, through wounds showed *P. digitatum* to be a vigorous fruit-rotting organism, and *P. italicum* a weak parasite or saprophyte. Observations in the field and packing shed, and in cold storage confirmed this result. *B. theobromae* was shown experimentally to enter grapefruit through the button at or shortly after picking time.

LEONARD (E. R.) & WARDLAW (C. W.). **Storage investigations with Trinidad Citrus fruits, 1935–36.**—*Mem. Low Temp. Res. Sta., Trin.*, 6, 28 pp., 8 graphs, 1937.

Further investigations into the storage behaviour of Trinidad grapefruit [see preceding abstract] showed that during the dry season quailing can be safely eliminated. The fruit should not be picked while wet with rain or dew if oleocellosis [ibid., xvi, p. 300] is to be avoided. The evidence indicated that for prolonged storage a temperature over 45° F. may be desirable; early cold storage with rapid cooling is advisable to check fungal growth and reduce loss in turgor. Grapefruit from different parts of Trinidad showed marked contrasts in the amount of fungal wastage that developed in storage, indicating that sanitation is probably faulty in some orchards.

In preliminary respirational studies it was found that grapefruit normally possesses a low internal concentration of carbon dioxide, and that wastage may be increased by exposure to relatively low carbon dioxide concentrations.

[A summarized account of these investigations and those described

in the preceding abstract appears in *Trop. Agriculture, Trin.*, xiv, 4, pp. 95–96, 1937.]

DOIDGE (E[THEL] M.) & VAN DER PLANK (J. E.). **The fungi which cause rots of stored Citrus fruits in South Africa.**—*Sci. Bull. Dep. Agric. S. Afr.* 162, 23 pp., 1936. [Received July, 1937.]

A special survey [the results of which are tabulated] of the fungi occurring on stored citrus fruits in South Africa, carried out under high temperature and long storage conditions in order to favour the development of all pathogens present, showed that the only important fungi commonly found on oranges and lemons were *Penicillium digitatum* and *P. italicum* [*R.A.M.*, xv, pp. 497, 716; xvi, p. 529 and next abstract]. The former is the most important rotting organism in South Africa, Navel oranges being highly susceptible to it, though Valencias are usually resistant. *P. italicum* is generally unimportant, but occurs to a small extent in most consignments; it causes severe rotting occasionally, and in one instance was observed to enter through oleocellosis spots [ibid., xvi, p. 94]. Except for these two, the more vigorous pathogens were generally scarce, the only other organisms widely prevalent being *Alternaria citri* [ibid., xv, p. 716] and *Colletotrichum gloeosporioides* [loc. cit.], both of which produce a slow decay unlikely to become serious under normal conditions of storage and marketing. *A. citri* is possibly the commonest cause of decay in Valencia oranges [cf. ibid., viii, p. 237].

Other records on oranges included *Diplodia natalensis* (generally unimportant), *Fusarium angustum* [ibid., xii, p. 486], *F. lateritium* [ibid., xv, p. 495], *F. oxysporum*, *F. sambucinum* [ibid., xvi, p. 560], *F. sambucinum* f. 2, *F. scirpi*, *F. scirpi* var. *compactum*, *F. semitectum* var. *majus*, *F. solani* [ibid., xv, p. 764], *F. stilboides*, *F. vasinfectum*, *Oospora citri-aurantii* (uncommon in South Africa) [ibid., xiv, p. 428], *Phoma citricarpa* [ibid., xvi, p. 247], *Phomopsis* [*Diaporthe*] *citri* (not causing extensive damage), and *Trichoderma lignorum*.

PUTTERILL (V. A.) & DREYER (D. J.). **Citrus wastage investigations. Progress Report No. 4. Season 1935.**—*Bull. Dep. Agric. S. Afr.* 169, 24 pp., 1936. [Received June, 1937.]

A fully tabulated account is given of packing tests during the 1935 season in the Transvaal and Eastern Cape Province, which showed that in the Transvaal mould [*Penicillium digitatum* and *P. italicum*: *R.A.M.*, xv, p. 363 and preceding abstract] wastage was reduced from one mouldy fruit per four lug-boxes in the preceding season to one in 52 boxes at grader intake. This improvement is attributed to the curtailment of the 48-hour wilting period which, while being a distinct advance on previous practice, still allowed too much scope for the possible effects of any of the unforeseen delays that are apt to occur during the harvesting operations. The first packhouse consignment developed after 21 days' cold storage a degree of waste of the same order as the shorter wilted fruit of the wilting tests, whereas the comparable consignment of 1934 was very much more wasty, the difference being ascribed almost entirely to the improved conditions in the packhouse in respect of mould infection. Washing the harvested fruit with 8 per

cent. borax solution both in the grove and four days later in the packhouse, or with 8 per cent. metaborate in the packhouse only, reduced the mould wastage, as established by examination 7, 14, and 21 days after arrival in England, to a general average of 1 per cent., as against a mean percentage of 2, 6, and 3, respectively, found on the same dates in the controls. Washing with 1 per cent. caustic soda in the groves alone gave a mean percentage of wastage of 1, 2, and 4, respectively. In tests with oranges artificially inoculated by handling them gently with spore-contaminated gloves, the tightly packed boxes developed one and a half times more waste than the looser packed boxes; wilting the fruit somewhat reduced the wastage.

At the Grahamstown packhouse the number of wasty oranges worked out at 1 fruit in 20 lug-boxes, as compared to 1 in 16 in 1934. Great attention was paid to keeping down the mould spore contamination in the packhouse by regularly spraying with formalin all the parts of the plant and conveyances with which the fruit comes into contact, a precaution which is felt to have helped to reduce mould wastage. Dipping the oranges for 3 minutes in an 8 per cent. metaborate solution at 75° F. appeared to retard mould development during the first three weeks after discharge in England, but the waste by the fourth examination was practically identical with that in the control. Tight, as against loose, packing of artificially inoculated fruits in boxes had an effect on mould development very similar to that in the Transvaal.

HAAS (A. R. C.). **Boron deficiency effects similar in general appearance to bark symptoms of psorosis in Citrus.**—*Soil Sci.*, xliii, 4, pp. 317–325, 2 pl., 1937.

When boron was alternately omitted from the culture solution (containing 0·1 p.p.m. of manganese and of iron as tartrate) in which Valencia orange cuttings were growing and supplied at the rate of 1 p.p.m., the following symptoms were observed during one of the recovery periods: new growth in certain shoots and complete defoliation in others, corky ridges in the bark, a smooth callused area covering much of the surface of the main branch, a callused bark wound on the upper portion of the trunk, and the sloughing of the bark accompanied by callus formation underneath on the lower part. The absence of boron from the nutrient solutions of budded orange trees (6 ft. or more in height) in 12 gall. earthenware jars resulted in longitudinal splitting of the bark of the trunk and large branches, the wounds in some cases being 3 in. or more in length. Active callusing took place within five days of the addition of 5 p.p.m. boron to the solution. In orange trees in sand cultures the omission of boron further led to the development of numerous scales, resembling those associated with psorosis [*R.A.M.*, xvi, p. 451 and next abstracts] on the outer bark layers.

Analysis of dry bark samples of healthy and psorosis-diseased Washington Navel orange trees suggests a connexion between the boron content of the soil and the infectious principle of psorosis. As far as they go the data obtained indicate a higher boron and pectin content and a lower proportion of calcium in healthy than in diseased trees. Psorosis is known to occur, however, in districts where citrus cultivation is complicated by the excessive boron content of the soil [ibid., xi,

p. 570], so that no etiological connexion can at present be established between the deficiency of this element and the disease.

FAWCETT (H. S.). **Novos rumos no combate á psorose dos Citrus.** [New methods for the control of psorosis of Citrus.]—*Biologico*, iii, 3, pp. 81–84, 2 pl., 1937.

In view of the recent confirmation of the existence of psorosis of citrus trees in Brazil [see preceding and next abstracts], the author gives a brief account of the measures which have been newly adopted in California for its control. In their main lines they consist in the careful selection of the sweet orange, pomelo, and tangerine trees from which the grafts are taken, any individual showing the slightest symptom of psorosis [a brief morphological description of which is included] in its bark or leaves being strictly rejected. The trees selected should be preferably at least 20 years old and in no case under 10, excepting where the mother-tree is itself a graft taken from another tree known to be healthy. All the cuttings taken from one mother-tree should be used to graft stocks in one block in the nursery, so that should any one of the grafts exhibit psorosis symptoms during the first year of growth, the whole lot may be destroyed without loss of time. Lemons and limes may be symptomless carriers of the disease, and are generally much more resistant to it than the other citrus species; when grafted on sweet orange stocks, the latter should be free from psorosis. Before a lemon or lime tree is accepted as a mother-tree for grafts, its health should be tested either by grafting a sweet orange bud on it or by first making a few experimental grafts from it on sweet orange.

FAWCETT (H. S.), GRILLO (H. V. S.), BITANCOURT (A. A.), & MÜLLER (A. S.). **Relatorio sobre as doenças dos Citrus no Districto Federal, Estado do Rio de Janeiro e Minas Geraes.** [Report on Citrus diseases in the Federal District, State of Rio de Janeiro, and Minas Geraes.]—*Rodriguésia*, ii, 7, pp. 329–344, 1936. [Received June, 1937.]

This report, issued on the conclusion of Fawcett's visit to Brazil at the end of 1936, is divided into two principal parts, the first of which, signed by the three first-named authors, deals with the diseases of citrus trees in the Federal District and the State of Rio de Janeiro, where the most important troubles are stated to be melanosis and stem-end rot (*Phomopsis* [*Diaporthe*] *citri*) [see next abstract], foot rot (*Phytophthora parasitica*), sweet orange scab (*Elsinoe australis*) [*R.A.M.*, xvi, p. 451], sour orange scab (*E. fawcetti*) [ibid., xvi, p. 452], psorosis [see preceding abstracts], and zonate chlorosis [ibid., xv, p. 13]. It also contains recommendations for the control of these diseases, chiefly based on the results of recent work done either locally or in the United States. A briefly annotated list is also given of minor diseases of citrus species, and it is stated that in all the districts visited the environmental conditions appear to be favourable for the development of entomogenous fungi attacking the citrus coccids [ibid., xv, p. 216]. The second part, signed by Fawcett and Müller, gives an account of the investigations carried out in the State of Minas Geraes, where the major citrus

diseases are foot rot, psorosis, sour orange scab, and melanosis. In the Bello Horizonte region the death was observed of citrus shoots [species not indicated], 10 to 12 cm. long, in association with a growth of *Penicillium digitatum* on their surface. The authors confirm J. Deslandes's record of a new disease in the district of Lavras, characterized by the development of large chlorotic spots on the leaves, and believed to be due to a virus; the symptoms appear to be intermediate between those of leprosis and zonate chlorosis. It was only observed in self-rooted trees under 20 years of age, at some distance from the city.

FRANCO (A.) & FERREIRA (C.). **A podridão peduncular das Laranjas. Estudo estatistico sobre o emprego do borax e da tesoura.** [Stem-end rot of Oranges. Statistical study on the use of borax and of clippers.]—*Rodriguésia*, ii, 7, pp. 295–300, 1936. [Received June, 1937.]

The authors state that the statistical analysis of the results of a small-scale experiment (on a total of 1,879 mixed oranges) carried out by the Plant Protection Service in Brazil showed that dipping the harvested oranges in a borax solution [concentration not indicated] was alone effective in the control of stem-end rot [*Diaporthe citri*; *R.A.M.*, xv, p. 797; xvi, p. 451], since the difference obtained by the variance method was 25 times the experimental error ($13{\cdot}7 \pm 0{\cdot}54$). No significant difference was found, on the other hand, between cutting the fruit with a specially built pair of clippers and pulling them off by hand.

BENATAR (R.). **Sobre uma nova mancha em epicarpo de 'Citrus sinensis' Osbeck causada pelo Phoma puttemansii n.sp.** [On a new spot on the epicarp of *Citrus sinensis* Osbeck, caused by *Phoma puttemansii* n.sp.]—*Rodriguésia*, ii, 7, pp. 306–313, 6 pl., 1936. [Received June, 1937.]

A brief progress report is given of morphological and cultural studies of a species of *Phoma* which in 1912 had been recorded (but not named) by Puttemans as occurring occasionally on orange fruit marketed in Rio de Janeiro, and in 1936 was found causing a spot on sweet oranges (*Citrus sinensis* var. 'Pera') in the State of Rio, Brazil, resulting in losses of about 5 per cent. in shipments from that State. The spots occur exclusively on the lower half of the fruit; at first they are small and dark grey, but gradually they extend to occupy up to one-third of the surface, and become carbonaceous-black; they also extend in depth and finally penetrate and rot the pulp. The fungus grows well on potato agar and potato slices, on which it produces a septate and torulose mycelium, at first white but later olivaceous-black. The pycnidia, mostly immersed in the ectocarp (rarely in the mesocarp) are subglobose or ellipsoidal, black, and 90 to 210 by 50 to 100 μ in diameter; the spores are ellipsoidal or oblong-ovate, rounded at both ends, and 6 to 13 by 4·5 to 7 μ. The fungus is considered to be new to science and is named *P. puttemansii* [with a Latin diagnosis]. The rot was reproduced in the laboratory by inoculating superficially scarified oranges with a culture isolated from a rotting fruit, but similar tests on ripening oranges on the trees gave negative results.

Bitancourt (A. A.). **A leprose e a proxima colheita de Laranjas.** [Leprosis and the coming Orange crop.]—*Biologico*, iii, 2, pp. 37–40, 1 fig., 1937.

After stating that recent surveys have shown that leprosis continues to increase in importance in orange groves in the State of São Paulo, especially in the Limeira region [*R.A.M.*, xv, p. 291], the author briefly describes the results of an experiment, in which heavily infected sweet orange trees were pruned bare of all their foliage in 1933 and 1934, and the next season produced a healthy new growth, free from all symptoms of the disease. The health of these trees was maintained without further pruning by spraying them with Bordeaux mixture. In the same groves a very considerable reduction of leprosis was obtained in another set of trees by applications of Bordeaux mixture without pruning, though the amelioration was gradual. He concludes from these findings that leprosis should not be difficult to eradicate, if it were not for the danger of reinfection from outside, due to the practice of the local growers who entrust the harvesting of their citrus crops to professional teams, the latter bringing their own implements, and frequently passing from a diseased grove directly to a healthy one. This danger could be obviated by subjecting all apparatus brought into the groves to disinfection either with formalin or Bordeaux mixture.

Ruggieri (G.). **Ricerche sull' affinità d'innesto del Limone 'Monachello' con altri Citrus.** [Researches on the grafting affinity of the Monachello Lemon with other Citrus varieties.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 79–86, 2 pl., 4 figs., 1937.

Experimental evidence is adduced showing that the Monachello lemon variety, which is resistant to mal secco (*Deuterophoma tracheiphila*) [*R.A.M.*, xvi, p. 527], is better suited for grafting on mandarin orange [*Citrus nobilis*] and sweet orange than on lemon or sour orange [*C. aurantium*]. Italian growers, pending further investigations, are recommended to reconstitute their groves with sweet orange grafted on sour orange and then to regraft Monachello lemon on the sweet orange.

Bouhelier (R.). **Chloroses des Aurantiacées: foliocellosis et maladies de carence.** [Chloroses of the Aurantiaceae: foliocellosis and deficiency diseases.]—[*Rev. maroc.*] *Fruit Primeurs*, vii, 74, pp. 143–146, 1 fig., 1937.

The author gives details of an experiment carried out in Morocco in which, in September, 1935, an orange tree severely affected by mottle leaf [*R.A.M.*, xvi, p. 378] was treated by sprinkling the soil round it with 3 kg. zinc sulphate mixed with 10 kg. iron sulphate, a second severely affected tree receiving a similar application of 3 kg. zinc sulphate mixed with 2·5 kg. potassium sulphate. In May, 1936, the former tree was sprayed with 0·1 kg. zinc oxide and 1 kg. white oil in 100 l. water, and the latter with 1 kg. zinc sulphate per 100 l. and sufficient lime to produce alkalinity. Two slightly affected trees received the spray treatments only. By December, 1936, all four trees showed very marked improvement, and by the following April were practically normal, although during the period of the experiment other

affected trees some distance away grew progressively worse. Of the soil applications, the mixture containing the potassium sulphate appeared to give the better results. Though the sprayed leaves recovered their normal colour, the young shoots that developed later in some cases showed traces of the disease.

PRESLEY (J. T.) & THOM (C.). **'Spore mats' of Phymatotrichum omnivorum.**—*Phytopathology*, xxvii, 4, p. 588, 1937.

Better 'spore mats' of the cotton root rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xvi, p. 454] for investigation in the field at Sacaton, Arizona, were found to be obtainable by protecting them from the sun, wind, and insects. The white, cheesy masses of mycelia were carefully covered as they began to develop, and within a week the supporting cells had broken down and the mat was largely composed of a powdery spore mass enveloped by a loose hyphal membrane and bearing a general resemblance to the closed fruit body of a Gasteromycete or to some obscure accessory structure of an Ascomycete, rather than to the fruit mass of a Hyphomycete.

ARNDT (C. H.) & CHRISTIE (J. R.). **The comparative rôle of certain nematodes and fungi in the etiology of damping off, or soreshin, of Cotton.**—*Phytopathology*, xxvii, 4, pp. 569–572, 1937.

In controlled experiments conducted in 1935–6 to determine the relative influence of various nematodes and fungi in the etiology of damping-off or sore shin of cotton in South Carolina, *Fusarium moniliforme* [*Gibberella moniliformis*], as previously reported by N[aomi] C. Woodroof [*R.A.M.*, vi, p. 609], tended to reduce germination by 10 to 15 per cent. as compared with the controls, and greatly to increase the number of lesions on the hypocotyls, without, however, causing typical damping-off. The addition of nematodes to the crocks infested with *G. moniliformis* did not significantly augment the incidence and severity of the disease but caused some reduction in the average plant weight. Somewhat inconclusive results were obtained with *Fusarium vasinfectum*, while *Glomerella gossypii* [ibid., xvi, p. 173] caused typical damping-off in all the tests. In the 1935 series only 28 per cent. of the original seedlings (germination 80 per cent. of that of the controls) were alive after nine weeks, and they were mostly small and diseased. Neither with *F. vasinfectum* nor *G. gossypii* was there any appreciable increase in the severity of seedling injury as a result of the addition of nematodes to the cultures.

BITANCOURT (A. A.). **O carimã ou anthracnose das maças de Algodoeiro.** [The 'carimã' or anthracnose of Cotton bolls.]—*Biologico*, iii, 3, pp. 101–102, 1937.

Anthracnose of cotton bolls is stated to be very prevalent in the cotton plantations of São Paulo, where it is commonly attributed to the agency of a fungus [? *Glomerella gossypii*]; the etiology of the disease, however, is complicated by the fact that very frequently the typical anthracnose spots, dark wine-red and depressed, are mixed with bacterial spots which, in early stages of development, only differ from the healthy tissue in their oily appearance and slightly darker colour.

Often, too, the bacterial spots may develop in very young bolls, free from typical anthracnose lesions, leaving open the question of which of the two organisms is the primary pathogen. In the West Indies the bacterium [*Bacterium malvacearum*] is held to be the responsible agency, and this view is supported by S. C. Harland, who bases his opinion on the fact that some new cotton varieties, recently introduced by him into the State of São Paulo, exhibit a high degree of resistance to the bacterium, and have so far remained immune from anthracnose lesions.

GRILLO (H. V. S.). **Relatorio sobre a murcha do Algodoeiro, causada pelo 'Fusarium vasinfectum' Atk. no Estado da Parahyba.** [Report on the wilt of Cotton, caused by *Fusarium vasinfectum* Atk. in the State of Parahyba.]—*Rodriguésia*, ii, 7, pp. 319–327, 6 pl., 1936. [Received June, 1937.]

In this report to the Director of the Institute for Plant Biology in Rio de Janeiro, at whose request he visited the State of Parahyba in April, 1936, the author states that his personal investigations, supported by the study of material collected by him or sent in to him later, definitely established the presence in that State of cotton wilt (*Fusarium vasinfectum*) [*R.A.M.*, xvi, p. 380]. The infected areas appear to be few and limited, and recommendations are made with a view to preventing further spread of wilt, such as the total destruction of all cotton plants and other hosts infected with *F. vasinfectum*, quarantine restrictions of exports from the State, prohibition of the movement of animals from the infected areas and obligatory disinfection of the clothing of persons working in diseased fields and of their implements, and finally, the use for planting of resistant varieties.

GEITLER (L.). **Über einen Pilzparasiten auf Amoeba proteus und über die polare Organisation des Amöbenkörpers.** [On a fungal parasite of *Amoeba proteus* and on the polar organization of the amoebal body.]—*Biol. Zbl.*, lvii, 3–4, pp. 166–175, 3 figs., 1937.

Details are given of the infestation of about 95 per cent. of some 400 individuals of *Amoeba proteus* at the Lunz (Austria) Biological Station by a fungus with fasciculate, non-septate hyphae, up to 100 (rarely 200) by 3 to 4 μ, arising from a vesicular haustorium situated in the entoplasm of the host; intercalary, seldom terminal, subspherical resting cells, up to 12 μ in diameter, are formed on amoebae dying after a week in captivity. Zoospores were not actually observed, but may be assumed to proceed from the plurinuclear resting cells and to act as sources of infection. The fungus is a Phycomycete and presumably belongs near the Cladochytriaceae in the Chytridiales. Its habit is definitely parasitic, but the extent of the injury could not be appraised.

NEEDHAM (N. V.). **A bacterial disease of Aphis rumicis Linn., apparently caused by Bacillus lathyri Manns and Taubenhaus.**—*Ann. appl. Biol.*, xxiv, 1, pp. 144–147, 1937.

The author states that an organism culturally similar to *Bacillus lathyri* [*R.A.M.*, xv, p. 101] was isolated from dead and surface-

sterilized individuals of a colony of *Aphis rumicis* showing an abnormally high mortality, in that the aphids died within 24 hours from their removal from the broad bean (*Vicia faba*) host plant on which they were raised, while control colonies survived for four days.

BUTLER (E. J.). **Acladium castellanii Pinoy and the existence of the so-called acladiosis of Castellani.**—*Parasitology*, xxix, 2, pp. 259–265, 1 col. pl., 9 figs., 1937.

Following a summary of previous records and descriptions of the fungus known as *Acladium castellanii* [*R.A.M.*, xvi, p. 483], a human pathogen in the south-east of Asia and Europe and in Brazil, the author gives details of his studies of cultures of the organism received from R. Craik (who renamed it *Pseudomicrosporon castellanii* in *J. trop. Med.* (*Hyg.*), xxvi, p. 184, 1923) and Castellani.

The fungus was grown on various natural substrata and laboratory media, of which carrot and potato agar proved to be the most suitable. On the former the colonies were white or gradually turned yellow, whereas on the latter they changed from white to deep brown or black. In the early stages of growth there was some indication of the *Acladium* type of sporing, which was soon superseded, however, in vigorous cultures by the formation of clusters of piriform to oval, hyaline conidia, 4·5 to 7 by 3 to 4 μ, at the ends of the lateral hyphal branches. These organs are either inserted directly on the hyphae or attached to the latter by means of small, tooth-like processes sometimes long enough to form a kind of stalk. Craik's 'facet of articulation' is usually recognizable only in the conidium-like bodies formed on submerged hyphae. Tapering coremia, composed of broader and straighter hyphae than those constituting the creeping mycelium, were formed at an advanced stage in active cultures, especially on carrot, and gave rise to abundant conidia. Unicellular, spherical or occasionally clavate chlamydospores were observed principally in the submerged growth. The aerial conidia appear to belong to the type termed 'radula spores' by E. W. Mason in his Annotated Account of Fungi received at the Imperial Mycological Institute, List II (Fascicle 2), p. 9, 1933, and are regarded by the writer as thallospores rather than as true conidia, especially in the light of their presumed connexion with the above-mentioned spore-like bodies in the submerged mycelium.

A. castellanii closely resembles the descriptions of human and animal pathogens of the form genus *Sporotrichum* (*Rhinocladium* of some authors) [see next abstract], and it is obvious from comparative studies of this fungus and *S. schenckii* [ibid., xvi, p. 254] that the agent of acladiosis must at any rate be referred to the genus *Sporotrichum* and probably to the species *S. schenckii*, the limits of which are believed to be sufficiently wide to embrace a number of the so-called 'new species' of the genus subsequently recorded as human and animal pathogens. *S. councilmani* [ibid., xiv, p. 405], for instance, is considered by C. W. Dodge [ibid., xv, p. 368] to be only a variety of *S. schenckii*, and it may be assumed that *A. castellanii* occupies a similar position. Such being the case, the use of the term 'acladiosis' to denominate a distinct disease should be discontinued.

Hope (E.). **Sporotrichosis among violinists.**—*J. Lab. clin. Med.*, xxii, 7, pp. 708–711, 1937.

A species of *Sporotrichum* was isolated from submaxillary lesions in several students belonging to the same musical organization and from the chin rests of their violins, which obviously served as agents in the transmission of infection from one person to another. No pathological symptoms developed in rats inoculated with the fungus, which was recovered, however, from the liver and spleen.

Langeron (M.) & Milochevitch (S.). **Sur une méthode employée par Acton et Dey pour régénérer les cultures pléomorphisées des dermatophytes.** [Note on a method used by Acton and Dey for the regeneration of pleomorphized cultures of dermatophytes.]—*Ann. Parasit. hum. comp.*, xv, 2, pp. 177–181, 1937.

The authors conducted experiments to check the results recently described by Acton and Dey (*Indian med. Gaz.*, xix, p. 601, 1934), who claimed to have restored their original character to pleomorphic cultures of a number of species of *Microsporon, Ctenomyces, Achorion*, and *Epidermophyton* by growing them on feathers, on which they were allowed slowly to desiccate. The present work did not support these findings. Once entirely established, pleomorphism was found to be irreversible [cf. *R.A.M.*, xvi, pp. 100, 383], but using cultures in a less advanced stage of pleomorphism, colonies may be sometimes obtained, presenting more or less typical characters, in direct dependence on the degree of modification attained by the fungus.

Bigham (A.). **Investigations into the presence of yeast-like organisms in scaly lesions.**—*Brit. J. Derm.*, xlix, 2, pp. 74–79, 1937.

This is a summary of observations on the presence of yeast-like organisms in 50 cases of scaly disorders of the skin, with special reference to the *Pityrosporon* of Malassez [*P. malassezi*: ibid., xvi, p. 316]. This fungus was present in scales from the scalps of seven cases of seborrhoeic dermatitis, two of eczema, four of psoriasis, seven of pityriasis rosea, one of alopecia areata, and one of nasal carcinoma. It was, however, also detected in the scalps of 20 normal persons, and is not believed to be a primary cause of disease, some underlying factor, possibly of a metabolic order, being required to stimulate it to pathogenicity.

Taber (K. W.). **Torulosis in man.**—*J. Amer. med. Ass.*, cviii, 17, pp. 1405–1406, 1937.

Following a general survey of the available knowledge concerning human torulosis [*R.A.M.*, xv, pp. 222, 651], the writer gives clinical details of a fatal case of this disease in an elderly woman. The organism isolated from the sputum developed a profusion of shiny, salmon-pink colonies and corresponded in general cultural characters to *Cryptococcus pararoseus*.

Levin (E. A.). **Torula infection of the central nervous system.**—*Arch. intern. Med.*, lix, 4, pp. 667–684, 7 figs., 1937.

Full clinical details are given of two fatal cases of torulosis [see preceding abstract] of the central nervous system caused by *Torula*

histolytica [*Cryptococcus hominis* or *Debaryomyces neoformans*: *R.A.M.*, xvi, p. 534], both in adult males. The organism, isolated from the spinal fluid, grows readily but slowly on the standard bacteriological media, though its development is favoured by an acid substratum, e.g., Sabouraud's maltose agar. Growth is equally profuse at room temperature or in the incubator. The colonies first appear as minute, elevated, whitish, circular, glistening dots with well-defined margins, of a moist, pasty consistency, turning yellowish-brown with age; they are Gram-positive at first, later Gram-negative. The most characteristic feature of the fungus—a clear zone or halo surrounding each cell—is conspicuous in India ink preparations of one-month-old colonies. The sugar-fermenting capacity of *D. neoformans* is very slight. In laboratory animal (white mice) tissues fungal cells range from minute, round objects only a few μ in diameter, to large, circular, spherical or oval bodies, 40 to 50 μ in diameter, with sharply defined margins and often with double contours. Capsule formation and staining reactions are variable. Minute granules are frequently visible within the cells. Reproduction in the tissues, as in culture, is effected solely by budding.

COTTINI (G. B.). **Due casi di onicomicosi favosa.** [Two cases of onychomycosis of the favus type.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xv, 1, pp. 66–68, 1 pl., 1937.

Clinical details are given of two cases of onychomycosis, one in a five-year-old girl and the other in a three-year-old boy, caused by *Achorion schoenleini* [*R.A.M.*, xvi, pp. 39, 252, 316, 317, *et passim*, and next abstract].

LEWIS (G. M.), ROSENFELD (H.), & HOPPER (MARY E.). **Favus of the glabrous skin.**—*Med. Rec., N.Y.*, cxlv, 5, pp. 189–193, 3 figs., 1937.

Attention is drawn to the involvement of *Achorion schoenleini* [see preceding abstract] in superficial infections of the smooth skin, which probably account, judging by the writers' recent observations in New York, for nearly 30 per cent. of all cases of favus. If the lesions on the glabrous skin are not typical scutulae, they may resemble tinea circinata or be present as ill-defined, erythematous, and scaly areas. Only one of eleven cases [four of which are here described] showed infection of the nails following invasion of the scalp, the smooth skin in this instance being unaffected.

DAVIS (A. H.) & WARREN (E. L.). **Pulmonary moniliasis: report of a fatal case.**—*J. Lab. clin. Med.*, xxii, 7, pp. 687–697, 3 figs., 1937.

Following a review of the literature on pulmonary moniliasis, the writers describe a fatal case of the disease in a 45-year-old man due to *Monilia* [*Candida*] *albicans* [*R.A.M.*, xvi, p. 533], the morphological, cultural, biochemical, and serological characters of which are discussed, with observations on the pathogenicity of the fungus to man and laboratory animals.

CLERF (L. H.) & BUCHER (C. J.). **Blastomycosis of the larynx.**—*Ann. Otol., &c., St Louis*, xlv, 4, pp. 923–939, 11 figs., 1936.

The morphological, cultural, and biochemical characters of the fungi

isolated from the larynx in five cases of chronic inflammatory processes simulating tuberculosis [cf. preceding abstract] are summarized, together with observations on their pathogenicity to laboratory animals. In two of the cases the organism was referable to *Monilia* (Castellani), in two to *Blastodendrion* [*R.A.M.*, xv, p. 367], and in one to *Candida krusei* [ibid., xvi, p. 177].

BALESTRIERI (F.). **Su di un caso di moniliasi polmonare.** [On a case of pulmonary moniliasis.]—*Riv. Pat. Clin. Tuberc.*, x, 4, pp. 229–232, 1936.

From the sputum of a 25-year-old agricultural labourer suffering from bronchial disturbances the writer isolated on Sabouraud's agar a fungus of the *Monilia mannitofermentans* group [*R.A.M.*, viii, p. 574], filtrates from cultures of which induced a positive reaction on intradermal infection into the patient but were negative to other persons.

LOOPER (E. A.). **Mycotic infections found in the trachea and bronchi.**—*Ann. Otol., &c., St Louis*, xlv, 4, pp. 1153–1164, 1936.

Drawing attention to the prevalent confusion between tuberculosis and bronchomycotic conditions [*R.A.M.*, xvi, p. 382], the writer gives clinical details of eleven cases of disease of the lower respiratory tract associated with fungal infection, e.g., by *Aspergillus fumigatus, A. glaucus* [ibid., xvi, p. 317], *Coccidioides immitis* [ibid., xvi, p. 461], *Monilia,* and *Penicillium.* The importance of bronchoscopy in the recognition and correct diagnosis of such disturbances is emphasized.

TERVET (I. W.). **An experimental study of some fungi injurious to seedling Flax.**—*Phytopathology*, xxvii, 4, pp. 531–546, 3 figs., 1937.

Severe seedling blight of Winona flax in steamed soil in the greenhouse was induced by strains of *Helminthosporium*, including an apparently undescribed species from barley, *H. sativum* from rye, barley, and flax, a form of the *Brachysporium* type from flax, and representatives of A. W. Henry's *Helminthosporium* N [*R.A.M.*, iv, p. 408] group from wheat and barley. Considerable injury in the shape of damping-off was further caused by strains of *Rhizoctonia* [*Corticium*] *solani* isolated from tomato, eggplant, flax, peas, barley, beans [*Phaseolus vulgaris*], sugar beet [ibid., xiv, p. 207], and rice, and by one of *R. bataticola* [*Macrophomina phaseoli*] from sugar-cane [ibid., xiv, p. 80], all from the United States; on the other hand, the strains of *C. solani* from potato were only slightly, if at all, pathogenic to flax. *Thielavia* [*Thielaviopsis*] *basicola*, isolated from flax roots [ibid., xiv, p. 362], under favourable conditions caused marked stunting, frequently accompanied by severe tap-root decay and extensive red and black lesions on the roots. *Ophiobolus cariceti* [*O. graminis*] from wheat also induced decay of the root system of flax. Under conditions conducive to infection, a strain of *Alternaria* from flax seed [ibid., xii, p. 220] is capable of causing severe damage to the roots. A *Pythium* isolated from wilt(*Fusarium lini*)-sick soil proved highly pathogenic to flax seedlings, only four out of 100 of which survived 13 days after planting; a strain from bean was equally virulent.

Six of the foregoing fungi, viz., *H. sativum* from rye, *T. basicola*,

O. graminis, *A.* sp., *C. solani* from flax, and *F. lini*, were tested for their pathogenicity to flax on maize (sandy loam), prairie, peat, and steamed (loam and sand) soils. Both *F. lini* and *H. sativum* were consistently virulent, though the symptoms induced by the latter varied according to the soil type. *O. graminis* and *T. basicola* did most damage on steamed soil, while the results obtained with *A.* sp. and *C. solani* were somewhat conflicting.

It would appear from these data that other fungi besides *F. lini* may be implicated in the decline of resistance to wilt under certain environmental conditions.

ESMARCH (F.). **Pilzkrankheiten des Flachses.** [Fungal diseases of Flax.] —*Kranke Pflanze*, xiv, 4, pp. 66–71, 1 pl., 1 fig., 1937.

Popular notes are given on the symptoms, mode of infection, and control of the following diseases affecting flax in Germany (where the acreage under this crop is stated to have increased from 4,800 hect. in 1933 to 45,000 hect. in 1936) and elsewhere: wilt (*Fusarium lini*), anthracnose (*Colletotrichum lini*), grey mould (*Botrytis cinerea*), rust (*Melampsora lini*), and *Cladosporium herbarum* [*R.A.M.*, ix, p. 246], which covers the stems both of growing and stored plants, and may considerably impair the value of the crop.

BURKHOLDER (W. H.). **A bacterial leaf spot of Geranium.**—*Phytopathology*, xxvii, 4, pp. 554–560, 1 fig., 1937.

Phytomonas geranii n. sp., the agent of a destructive brown spotting and necrosis of *Geranium sanguineum* leaves at Ithaca, New York, is a uniflagellate rod occurring singly, in pairs, or in short chains, 2 by 0·75 μ, Gram-negative, forming primuline-yellow colonies on beef extract-peptone agar at 27° C., liquefying gelatine, alkalizing and clearing milk, reducing nitrates, forming ammonia and hydrogen sulphide, and utilizing dextrose, levulose, galactose, xylose, rhamnose, lactose, maltose, sucrose, raffinose, glycerol, and citric, lactic, malic, malonic, and succinic acids.

The interveinal lesions produced by *P. geranii* average 2·5 mm. in diameter, sometimes coalescing to cover relatively large areas of the leaf, on the upper side of which the spots are dark brown, often with a reddish tinge, while below they are slightly water-soaked. The stems and petioles were only occasionally attacked. The organism, in a virulent form, was isolated in March, 1936, from lesions on the leaves of *G. sanguineum* plants that had overwintered in the open under mulch and snow. Positive results were given by inoculation experiments with *P. geranii* on its own host, *G. maculatum* (which showed some degree of resistance), *G. pratense*, and *G. sylvaticum*, but the common red-flowering house geranium (*Pelargonium hortorum*) appears to be immune.

MCCULLOCH (LUCIA). **Bacterial leaf spot of Begonia.**—*J. agric. Res.*, liv, 8, pp. 583–590, 1 fig., 1937.

A brief account is given of a bacterial leaf spot of begonias, which is stated to be widespread in the United States, causing losses varying from 1 to 50 per cent., probably in direct dependence on the conditions

under which the plants are grown. The disease at first appears as tiny, clear specks on the lower surface of the leaf, gradually enlarging to more or less circular, translucent, pale green or colourless spots, becoming brown and opaque in the centre with a yellow, translucent halo, and measuring from 1 to 8 mm. in diameter. The spots are occasionally also found on the leaf bracts, but have not been observed on the petioles or veins. Severe attacks may lead to heavy defoliation of the plants. The organism isolated from young lesions is a slender, motile rod, rounded at both ends, occurring singly or in pairs, with a single polar flagellum, and averaging 0·9 to 1·8 by 0·3 to 0·4 μ in diameter. It is aerobic, Gram-negative, non-acid fast, sometimes with very indefinite capsules, does not produce spores or involution forms, liquefies gelatin, rapidly clears milk, produces ammonia and hydrogen sulphide, hydrolyses starch, does not reduce nitrates, grows well in Uschinsky's solution and makes a yellow growth on beef agar. It resists drying for 56 days or over, and its temperature relations are maximum 37° C., minimum below 8°, optimum about 28°, and thermal death point about 50°. It was experimentally shown to be pathogenic to all the species and varieties of begonias tested and very slightly to *Pelargonium*. The organism is considered to be new to science and is named *Bacterium flavozonatum*.

The development of the disease is stated to be favoured by warm, moist, poorly ventilated and crowded conditions, and could be effectively prevented by adequate spacing, with regulated temperature and moisture in the houses. Infected leaves should be removed and destroyed.

MONCHOT (E.). **Sur un nouvel Uromyces de l'Oeillet cultivé, Uromyces dianthi-caryophylli n. sp.** [On a new *Uromyces* of cultivated Carnation, *Uromyces dianthi-caryophylli* n. sp.]—*Rev. Path. vég.*, xxiv, 2, pp. 133–136, 1 fig., 1937.

Comparative measurements of the uredospores and teleutospores of *Uromyces caryophyllinus* [*R.A.M.*, xii, p. 107; xiii, p. 656; xiv, p. 244; xv, pp. 109, 733], *Uredo dianthicola* (herbarium material), and of a rust found on hothouse carnations in France showed that the former organs measured, respectively, 21 to 29 by 20 to 26 (generally 26 by 24) μ, 21 to 35 by 18 to 26 (30 by 21) μ, and 10 to 30 by 14 to 21 (24 by 18) μ, while the teleutospore measurements of the first fungus were 23 to 31 by 16 to 22 (generally 25 by 20) μ, and of the last up to 25 by 16 to 21 (21 by 19) μ. In view of these and certain morphological differences, such as membrane thickness and number of germinative pores (of which the uredospores of the last-named fungus showed not more than three), the author considers that *Uromyces caryophyllinus* is a stable species in spite of the different sources of the material examined, that *Uredo dianthicola* is a distinct species not synonymous with the foregoing, and that the carnation rust is a new species, which is accordingly named *Uromyces dianthi-caryophylli* n. sp. [without a Latin diagnosis], and is pathogenic to hothouse carnations.

HILDEBRAND (E. M.). **Infectious hairy root on Rose.**—*Plant Dis. Reptr*, xxi, 5, pp. 86–87, 1937. [Mimeographed.]

Phytomonas [*Bacterium*] *rhizogenes*, the agent of hairy root of apple

[*R.A.M.*, xvi, p. 191], was isolated from three out of four dormant rose (*Rosa multiflora japonica*) cuttings from a New England nursery and inoculated with positive results into *Kalanchoë daigremontiana*. After six weeks in pots 20 out of 26 diseased rose cuttings showed fresh hairy root developments, the majority of infections occurring on the underground stem, presumably through wounds inflicted in preparation for planting. This is believed to be the first record of natural infection by *Bact. rhizogenes* on rose cuttings. The material was reported to have originated in Texas, and about half the stand was attacked.

Di Micheli (G.). **A propos d'un Oidium du Laurier pas encore signalé.** [On a hitherto unreported *Oidium* on Laurel.]—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 4, pp. 84–85, 1937.

Laurel (*Laurus nobilis*) hedges in gardens in Florence showed on the under surfaces of the leaves a white, floury efflorescence due to *Oidium erysiphoides*, not previously recorded on this host in Europe. Adult leaves were those most seriously attacked, but the younger ones when infected were slightly curled and discoloured. The lower surfaces of the affected leaves became brown and spotted.

Buddin (W.) & Wakefield (E[lsie] M.). **A stem-canker disease of Gardenias.**—*Gdnrs' Chron.*, ci, 2623, pp. 226–227, 4 figs., 1937.

One- and two-year-old *Gardenia* plants raised from cuttings at a Middlesex nursery examined in January, 1937, were affected by a disease associated with an irregular foliar discoloration, especially at the leaf bases, and the development of swollen cankers over almost the entire underground part of the stems. Six-year-old plants subsequently observed at a Surrey nursery showed numerous stem cankers extending up to 1 ft. above soil-level. In the centre of these aerial cankers the wood was exposed over a length of 1 to 3 in., the affected area being surrounded by an extensive formation of wound callus. The stem cankers were found invariably to start from the bases of the 'snags' left after cutting the flowers. Both green and woody stems, 'snags', and cankers bore pycnidia of the *Phomopsis* type, the flattened cavity of which was lined with hyaline, non-septate, awl-shaped sporophores, 15 to 20 μ long, exuding under moist conditions pale ochraceous-salmon to Capucine buff masses or short tendrils of fusiform spores (hyaline when examined singly), ranging from 7 to 15 by 2·5 to 4·5 μ (average 9 to 11·5 by 3 to 4 μ), and so agreeing fairly closely with the A spores of a *Phomopsis* isolated from the same host in the United States [*R.A.M.*, xiv, p. 107], with which the fungus under observation is thought to be probably identical. Both are weak wound parasites controllable by the rational application of drastic sanitary measures.

Buddin (W.). **The grey bulb rot of Tulips and its control.**—*J. Minist. Agric.*, xliv, 1, pp. 54–59, 3 figs., 1937.

Besides attacking tulips, especially the Darwin varieties, *Sclerotium tuliparum* [*R.A.M.*, xv, pp. 135, 632] also occurs, though generally less severely, on iris [ibid., vii, p. 378], particularly the Imperator and Wedgwood varieties, *Scilla*, crocus, *Ixia*, *Fritillaria* [ibid., v, p. 557], *Colchicum* [ibid., xi, p. 423], hyacinth, and narcissus [ibid., xiv, p. 135].

The very young tulip shoots pushing through the soil become diseased first, and observations showed that bulbs planted with one-half to two-thirds of their surface protruding mostly remained healthy even in badly diseased soil.

In experiments with William Copland tulip bulbs planted in boxes of 25 each, in two kinds of infected soil subjected to various treatments, steaming completely eliminated the disease in both soils, soil treatment with formalin resulted in 0 and 1 healthy plants, respectively, and soil treatment with a powder containing chloronitrobenzol as the active agent 13 and 21 healthy plants, respectively, compared with one healthy plant out of 75 bulbs used in the controls. Bulbs shallow-planted in untreated soil and covered with long straw during rooting gave 21 and 24 healthy plants, respectively. In a similar test bulbs planted in untreated soil yielded one marketable flower, those in steamed soil 24, those in formalin-treated soil 9, and those in soil treated with the powder in the top layer only 23, as against 22 for the bulbs shallow-planted in the untreated infected soil.

The author mentions incidentally that investigations at Reading have shown that shanking of tulips [ibid., xii, p. 140] is caused by *Phytophthora cryptogea* and *P. erythroseptica*, almost perfect control of which has repeatedly been obtained by heating the contaminated soil with a 2 per cent. solution of commercial formalin several weeks before planting.

PRICE (W. C.). **Classification of Lily-mosaic virus.**—*Phytopathology*, xxvii, 4, pp. 561–569, 5 figs., 1937.

The symptoms of cucumber mosaic [*R.A.M.*, xvi, p. 518], cucumber mosaic strain 6, and celery mosaic [see above, p. 584] in *Lilium longiflorum* were found to be similar to those of lily mosaic [ibid., xv, p. 507] in this host, consisting of elongated, yellow spots enlarging and sometimes coalescing to produce foliar mottling with a tendency to necrosis. On transference from *L. longiflorum* to Turkish tobacco, the lily mosaic virus caused the development of localized zonate, yellow spots, sometimes surrounded by a necrotic periphery. Isolations from the affected tobacco foliage yielded a rapidly moving virus (herein referred to as the 'passage strain of lily mosaic virus') inducing a characteristic mottling of young tobacco leaves, and, on retransference to *L. longiflorum*, the typical symptoms of lily mosaic. The passage strain was readily transmitted from tobacco to Improved Long Green and Early Fortune cucumbers, on which it produced bright yellow chlorosis along the veins, accompanied in some instances by a mild yellow mottling, and retransferred to tobacco. The lily mosaic virus was conveyed directly to Golden Gem Midget *Zinnia elegans* plants, which developed localized yellow leaf spots, and the passage strain was also transmitted to the same host, resulting in a systemic yellow and green mottling similar to that induced by certain cucumber mosaic viruses. An inoculation experiment carried out with the lily mosaic virus passage strain, followed after a 19-day interval by cucumber mosaic 6, on ten young *Z. elegans* plants convincingly demonstrated the immunizing action of the former against the latter [cf. ibid., xvi, p. 414], the results being further substantiated by a second test comprising 20 plants. It is thus

apparent that the two viruses under observation are closely related, and that the lily mosaic virus should be placed in the cucumber mosaic virus category.

SMITH (O. F.). **A leaf spot disease of red and white Clovers.**—*J. agric. Res.*, liv, 8, pp. 591–599, 4 figs., 1937.

The disease briefly described in this paper was first observed in 1935 on red and white clovers (*Trifolium pratense* and *T. repens*) in a number of pastures near Madison, Wisconsin, where the damage caused by it was slight, since the lesions, in the form of dark brown, often irregularly shaped, concentrically zonate spots, similar to those produced by *Macrosporium* [*Thyrospora*: *R.A.M.*, xiii, p. 327] *sarcinaeforme* on red clover, were exclusively confined to comparatively few leaves of the hosts. Isolations from the spots readily yielded a fungus which was experimentally shown to be also pathogenic to *T. repens* var. *giganteum*, *T. hybridum*, *T. incarnatum*, *Melilotus alba*, *M. officinalis*, *M. indica*, and *Medicago sativa*. Failure, however, to produce spores or sclerotia in culture, and the absence of these organs in nature, prevented the identification of the fungus. Field and laboratory observations showed that under conditions of high humidity the aerial mycelium grows over the surface of infected leaves; a group of short diverging hyphae, closely applied to the surface, is formed at the point of contact of the tips of the aerial hyphae and the leaf; entrance into the host tissue is effected directly through the epidermis, either through or between the epidermal cells, after which the fungus spreads both inter- and intracellularly throughout the leaf tissue, killing the host cells in advance of its progress. Temperatures of 24° and 28° C. are most favourable for growth of the fungus in culture and for infection of red clover leaves.

CHAZE (J.). **Sur la production de choline dans les caryopses et les plantules de l'Ivraie enivrante, en rapport avec le parasitisme.** [On choline production in Darnel caryopses and seedlings in relation to parasitism.]—*C.R. Acad. Sci., Paris*, cciv, 19, pp. 1443–1445, 1937.

The writer reports his experimental observations on the elaboration of large quantities of choline in the caryopses and seedlings of darnel (*Lolium temulentum*) harbouring an endophytic fungus [*R.A.M.*, xvi, p. 267]. This nitrogenous base being absent from non-infected plants, there is reason to postulate a correlation between its development and the activities (probably diastatic) of the parasite.

DULLUM (N.) & ESBJERG (N.). **Forsøg med Rentabiliteten ved Sprøjtning af Æbletræer. II.** [Experiments in the profitability of Apple tree spraying. II.]—*Tidsskr. Planteavl*, xlii, 1, pp. 1–28, 1937. [English summary.]

Continuing the investigations initiated in Denmark in 1923 to determine the most profitable spraying schedules for the control of apple scab (*Venturia*) [*inaequalis*: *R.A.M.*, xi, p. 185] and red spider [*Tetranychus telarius*], the writers fully describe and tabulate the data of a series of tests carried out from 1929 to 1935 with different combinations of Bordeaux mixture ($\frac{1}{2}$: 1 : 100) and lime-sulphur (2 : 100) applied in the pink bud and calyx stage and three and six weeks, respectively,

after the latter. The disease was adequately controlled by all the treatments, while 44 per cent. infection occurred on the unsprayed trees. The least spraying damage was caused by the schedule in which the two first treatments consisted of lime-sulphur and the two last of Bordeaux mixture, and the most by the use of the latter throughout. In general, the replacement of Bordeaux mixture by lime-sulphur for the immediately pre- and post-blossom treatments represented an economy (of Kr. 304 and Kr. 799 per hect. per annum during the periods from 1929 to 1932 and 1932 to 1935, respectively), and an improvement in the quality and quantity of the treated fruit, but certain varieties e.g., Lane's Prince Albert and Lundbaek did not tolerate lime-sulphur. The Mølleskov and Cox's Pomona varieties were the most susceptible to scab in these tests, Filipa being relatively resistant.

LOEWEL (E. L.). **Ob 72, ein neues Spritzmittel gegen Fusicladium.** [Ob 72, a new spray against *Fusicladium*.]—*Gartenbauwiss.*, xi, 2, pp. 208–220, 7 figs., 1937.

Spraying experiments since 1935 in Altland on several important commercial apple and pear varieties showed that the spray material Ob 72 of the I.G. Farbenindustrie A.G., Höchst-am-Main, was equal in value to lime-sulphur–lead arsenate for the control of apple and pear scab (*Fusicladium* spp.) [*Venturia inaequalis* and *V. pirina*], and but little inferior, if at all, to cupric sprays [*R.A.M.*, xvi, p. 541]. Apart from its efficacy against the parasites, it is stated to have no effect at all, either injurious or stimulating, on the foliage of the sprayed trees, and to be non-toxic to bees. It mixes well with crude nicotine, and appeared to increase the resistance of stored apples and pears to storage rots and spots.

SCHMIDT (M.). **Venturia inaequalis (Cooke) Aderhold. VII. Zur Morphologie und Physiologie der Widerstandsfähigkeit gegen den Erreger des Apfelschorfes.** [*Venturia inaequalis* (Cooke) Aderhold. VII. Contribution to the morphology and physiology of resistance to the agent of Apple scab.]—*Gartenbauwiss.*, xi, 2, pp. 221–230, 18 figs., 1937.

After briefly referring to his previous communication in this series [*R.A.M.*, xvi, p. 187], the author gives details of his microscopic studies of the development after experimental inoculation in the leaves of the Gelber Edel apple variety of two monospore strains of *Venturia inaequalis*, to one of which the apple variety is susceptible, and resistant to the other; the results showed that while the mycelium of both strains is capable of entering the leaf tissues, that of the non-pathogenic strain is strongly retarded in its growth inside the host, and remains localized to very small spots of necrotic tissue, which macroscopically appear as minute reddish or chlorotic flecks. The same phenomena were also observed in a few other apple varieties when inoculated with a monospore culture of *V. inaequalis* to which they are resistant. Inoculations were also carried out with conidia from Landsberger Pippin on the leaves of a 1-year-old graft from a 7-year-old apple seedling which throughout its previous life had shown complete immunity from scab, in spite of the heavy infection of the surrounding trees; the inoculated

leaves developed minute red necrotic spots, within which mycelia strands were found. These findings are considered to suggest that resistance in the apple to scab is due to a reaction of the host cytoplasm against invasion by the parasite.

HERBST (W.), RUDLOFF (C. F.), & SCHMIDT (M.). **Vergleichend-morphologische Studien an verschiedenen Venturiaarten.** [Comparative morphological studies on various species of *Venturia*.]—*Gartenbauwiss.*, xi, 2, pp. 183–207, 25 figs., 1937.

The results of the investigations fully discussed in this paper showed that single-spore cultures of *Venturia aucupariae*, *V. crataegi* [*R.A.M.*, xii, p. 205], and *V. ditricha*, like those of *V. inaequalis* and *V. pirina*, differed widely from one another in morphological and physiological characters, the number of different forms found being exceptionally large. There was evidence supporting the view expressed by certain investigators that in *V. inaequalis* and *V. pirina* the different morphological types and their combinations represent hereditary races, an assumption which the authors are inclined to extend to the other three species studied. The different species varied in their production of conidia on certain culture media, but variations also occurred within one and the same species. The size and shape of the conidia were found, however, to be stable and of specific value from the standpoint of taxonomy. A form of *Venturia* was found on a *Sorbus* [*Pyrus*] *domestica* tree, the conidia of which were very similar to those of *V. inaequalis*, and another on *S.* [*P.*] *aucuparia* with conidia very similar to those of *V. crataegi*, indicating that the specific limits and specialization of *V. aucupariae* and *V. crataegi* should be further investigated and defined more clearly. In a 4-month-old culture of *V. ditricha* perithecia were found, provided with strong bristles, and one of which contained normally developed asci and ascospores; 14 cultures raised from the latter, including six monospore cultures, were of the same type as the original culture, suggesting that this strain of *V. ditricha* is homothallic, or that possibly the whole species is homothallic, a question which is now being further investigated.

MACLACHLAN (J. D.) & CROWELL (I. H.). **Control of the Gymnosporangium rusts by means of sulphur sprays.**—*J. Arnold Arbor.*, xviii, 2, pp. 149–163, 1 pl., 1937.

In experiments on the control of *Gymnosporangium juniperi-virginianae*, *G. globosum*, and *G. clavipes* on (*a*) apples and other Pomaceous hosts and (*b*) *Juniperus* spp. [*R.A.M.*, xvi, p. 542] in Massachusetts, satisfactory results were obtained with the following sulphur fungicides: linco colloidal, liquid lime (1 in 50), the Nova Scotia formula (4·2 lb. aluminium sulphate, 1·4 lb. liquid lime-sulphur, 1·2 lb. calcium arsenate, and 48 galls. water), and flotation sulphur, with the addition of the 'S.S.S. sticker' and spreader (Mechling Chem. Co., Canton, New Jersey). Against *G. juniperi-virginianae* on apples six applications (or seven if dry conditions prevail during May) should be given at 7- to 10-day intervals, beginning before the first rain after the emergence of the young leaves. A similar schedule may be adopted for *G. globosum* on susceptible Pomaceae, e.g., *Crataegus jonesae*. Both rusts are con-

trollable on *J. virginiana* by four sulphur treatments at three- to four-week intervals, the first being given before the initial aecidiospore discharge (middle of July for *G. juniperi-virginianae* and 1st August for *G. globosum*). *G. clavipes* on *C.* and *Amelanchier* spp. may be combated by three applications of one of the above-mentioned preparations at 7- to 10-day intervals, commencing at the opening of the blossom buds. *J. virginiana* and *J. communis* should be sprayed at three- to four-week intervals from the latter part of May onwards, terminating early in July if infection arises from *A.* spp. but not until September where *C.* spp. constitute the source of infection.

De Long (W. A.). **Calcium and boron contents of the Apple fruit as related to the incidence of blotchy cork.**—*Plant Physiol.*, xii, 2, pp. 553–556, 1937.

Analysis of the calcium and boron contents of parallel samples of Stark apples from different orchards, some of the fruits being visibly affected by blotchy cork [*R.A.M.*, xv, p. 663] while others were apparently unaffected and gathered from apparently unaffected trees, failed to reveal any direct relation between the boron and calcium contents, and did not show any consistent relation of boron content to blotchy cork incidence. The observation previously made [loc. cit.], however, that a low calcium content is associated with the occurrence of the condition was again confirmed.

Mezzetti (A.). **Un marciume di alcune varietà di Pere.** [A rot of certain Pear varieties.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 121–146, 7 pl., 1937.

From inoculation experiments [which are described] carried out on Passa Crassana and Bergamotte Espérèn pears with *Pleospora herbarum* and an *Alternaria* provisionally identified as *A. tenuis*, isolated from rotted fruits still attached to the trees of these and other varieties, the author tentatively concludes that both fungi can infect wounded pears even at 7·5° to 10° C. The symptoms produced resembled those seen in nature only when immature pears were inoculated, and it is probable that in any one variety susceptibility to infection is related to the degree of maturity reached by the fruit at the time of attack. Under certain conditions in nature either organism or both together can cause rotting of pear fruits attached to the trees, even if unwounded. In the experimental conditions, the *Alternaria* produced abundant conidia and *P. herbarum* abundant conidia and perithecia, the former organs developing at 16° to 18° but not at 7·5° to 10°, and the latter at both temperature ranges. In nature, both fungi probably spread by means of the conidia, which are generally produced on the fruits. Infection is favoured by the use during several seasons of paper bags to protect the fruits; these should be used only once.

Report of the Low Temperature Research Laboratory, Capetown, 1934–1935.—165 pp., 1 pl., 20 figs., 32 graphs, 1936. [Received June, 1937.]

In the section of this report [cf. *R.A.M.*, xiv, p. 491] dealing with the cold storage of plums (by Rees Davies, W. W. Boyes, and E. Beyers)

it is stated that Santa Rosa fruit reaching the over-ripe stage after previous cold storage developed numerous small, sunken areas on the surface; the tissue immediately under the sunken epidermis was hard and apparently suberized, and surrounded by a zone of injected tissue sometimes reaching almost to the centre. The consignment ripened without previous cold storage did not show the condition. Similar pitting occurred on Wickson fruit placed in cold storage before ripening.

The maximum amount of internal breakdown occurred in stage A (least mature) Santa Rosa plums stored at 34° F., and in stages B and C, at 37°, breakdown decreasing as the storage temperature was adjusted above or below these extremes. No fruit was stored at 45°, but this is considered as representing, probably, the storage temperature at which no breakdown would occur. At the lowest temperature tested (31°) under 10 per cent. of the plums developed breakdown. The data obtained indicated that under the present conditions of transport (over-all fruit temperature of 35°) plums picked when completely red, when showing 75 per cent. colour, and when showing 50 per cent. colour, will have approximately 60 to 70, 30 to 40, and 20 per cent. internal break-down, respectively. In most cases the optimum storage temperature for internal breakdown was 37°. In the Santa Rosa variety the flesh was injected and greyish, in Wickson it was dark or brown, in Gaviota it was injected or translucent, and jelly-like, while in Kelsey, as in Gaviota, scarcely any discoloration was present. In the condition referred to as 'browning' the flesh is normal except for a faint general discoloration evident in fruit stored for a long period (generally at 31°); the browning may start at the surface and proceed inwards or vice-versa. While picking at 80 to 90 per cent. red colour has been recommended as a general rule for plums to avoid bladderiness, the data obtained indicate that picking at this stage would still give 40 to 50 per cent. internal breakdown at a storage temperature of 35°. Seasonal factors appear to play an important part in the production of bladderiness in Kelsey plums. With Gaviota plums the best storage temperature was 31°, at which no internal breakdown occurred during the period necessary for export.

Leatheriness was induced in Kelsey fruits ripened at 45°, the temperature being too low to permit normal ripening.

E. Beyers states that the view that delayed storage was an important factor in the shedding of grape berries, involving wilting and dehiscence of the stalks after picking, was confirmed by a survey in 1934–5 which showed that water relationships in the vineyard affect the condition. Dropping of berries never exceeded 6 per cent. in irrigated vineyards but reached 62 per cent. in unirrigated ones. That some vineyards may be deficient in soil moisture is indicated by the fact that the areas chiefly affected are subjected to very hot, dry atmospheric conditions in summer. After picking the chief factor is the time elapsing before placing the grapes in cold storage, shedding increasing with increasingly delayed storage. Less dropping occurred in fruits picked in the riper than the earlier stages. When a number of varieties were tested less shedding occurred, on the whole, at storage temperatures of 31° and 34° than at 29°. Measures preserving the green condition of the stalks after picking reduce drop.

J. M. Rattray found that wastage of grapes by *Botrytis* [*cinerea*] was reduced by picking during the afternoon and was unaffected by delay in storage.

D. J. Dreyer states that experimental consignments to England of grapes in iodized wraps clearly showed that such wraps reduced mouldiness [ibid., xvi, p. 437] as compared with plain ones, though better means of using such wraps remain to be devised.

Experiments by J. M. Rattray on the borax treatment of oranges against *Penicillium digitatum* showed that the percentage waste declined as the concentration of the borax rose from 1 to 8 per cent., and also, to some extent, as the period of immersion was increased; immersions for 2 and 3 minutes in an 8 per cent. solution alone gave satisfactory control. The percentage waste diminished also as the temperature of the 5 per cent. and 8 per cent. solutions was raised, though increases of temperature of, and longer immersion in, the 1 per cent. and 3 per cent. solutions had little or no effect. The best treatment was 8 per cent. borax solution at 110° for 4 to 5 minutes.

Ruggieri (G.). **Sopra le micorize del Mandorlo.** [On the Almond mycorrhiza.]—*Boll. Staz. Pat. veg. Roma,* N.S., xvii, 1, pp. 165–168, 2 figs., 1937.

The roots of almond trees growing in hot, dry conditions in the province of Syracuse, Sicily, showed in the primary cortex an inter- and intracellular endophytic mycelium of the Phycomycetoid type [*R.A.M.*, vi, p. 221; viii, p. 190] with numerous short branches terminating in sporangioles. The cells containing the last-named organs were devoid of starch. No vesicles were observed. The mycelium on the external surface of the roots consisted of hyphae 5 to 6 μ in diameter with a very thick, fuliginous wall. The intracortical hyphae measured 3·5 to 4·5 μ in diameter. When observed at the end of February the autotrophic roots were nearly all dead, though they had been active at the end of the previous growing period. Most of the small living roots were infected.

Hartzell (A.). **Movement of intracellular bodies associated with Peach yellows.**—*Contr. Boyce Thompson Inst.*, viii, 5, pp. 375–388, 6 figs., 1937.

The author states that the microscopic examination of living tissues of peach trees affected with yellows [*R.A.M.*, xv, p. 730; xvi, p. 368] showed the presence in the cells of rapidly moving bodies which, at a magnification of 2,300, were found to be tadpole-shaped, the tail-like projection not being visible at low magnifications; in size they ranged from barely visible to 3 μ in length, and varied in number from one to as many as 50 in a single cell in advanced stages of the disease. In root tip tissue they were observed at least three months before the characteristic leaf and twig symptoms appeared, and were also found in style hairs of blossoms from diseased trees as soon as the flower buds opened. Bodies similar in appearance were observed in the cells of the intestinal wall and salivary glands of the leafhopper (*Macropsis trimaculata*) vector of peach yellows, which had fed for from one to three weeks on diseased

trees. They were either entirely absent or rare in the tissues of healthy peach trees and of leafhoppers reared on normal trees. Similar intracellular inclusions were also found in the cells of the midrib of aster plants affected with aster [*Callistephus chinensis*] yellows [ibid., xv, p. 808].

Cinematographic records prepared from living tissues showed the movements of the intracellular bodies in the living tissues of both the diseased peach trees and of the intestinal wall and salivary glands of the insect vector, and also in the released cell juice from infected tissues of both hosts. The bodies appeared to be moving for the most part in the cell sap of the vacuole, in a number of cases in a direction opposite to that of the protoplasmic stream. Evidence is adduced that the movement of the bodies is not Brownian. The studies are considered to show clearly that the bodies are not artifacts, and that in general they resemble the cellular inclusions of unknown nature associated with certain diseases of vertebrates, such as smallpox and rabies.

SCHNEIDERS (E.). **Über die Zellstäbe und ihre phytopathologische Bedeutung.** [On intracellular cordons and their phytopathological significance.]—*Gartenbauwiss.*, xi, 2, pp. 237–250, 9 figs., 1937.

In discussing at some length the etiological relationship of intracellular cordons in the vine to the 'Reisigkrankheit' of this host [*R.A.M.*, xvi, p. 231], the author points out that the occasional presence of these formations has been recorded by various investigators in the wood of a wide range of higher plants, suggesting that under certain conditions any plant may produce them. He then gives a brief account of experiments, in which blackberry cuttings, the wood of which does not normally contain intracellular cordons, were planted in soil heavily infected with 'Reisigkrankheit', in soil which had formerly borne diseased vines but had been treated with carbon disulphide, and in healthy soil, with the result that the first group developed symptoms strongly reminiscent of the 'Reisigkrankheit', and their wood was found to contain numerous intracellular cordons, while that of the second group showed only a few, and that of the third group did not contain any at all. In investigating a severe case of dying-off of cherries on the Rhine (a report on which was published by the author in collaboration with J. Fuess in *Gartenbauwiss.*, ix, 5, 1935), on soil which, according to the local growers had to be abandoned for the vine because of the 'Reisigkrankheit', it was shown that the wood of the dying trees contained a large number of intracellular cordons, while that of healthy trees or of trees affected with gumming did not contain any. Finally, the histological examination of the stems of potatoes affected with leaf roll, rosette, streak, or mosaic, showed that they also contained a large number of intracellular cordons, which are normally absent in healthy plants.

While these investigations are admittedly preliminary, and do not allow of forming any definite conclusions, they are strongly suggestive of an etiological connexion between the so-called virus diseases of plants and the intracellular cordons, and further research on these lines is advocated.

SCHMIDT (M.). **Infektionsversuche mit Sclerotinia cinerea an Süss- und Sauerkirschen.**—[Infection experiments with *Sclerotinia cinerea* on sweet and sour Cherries.]—*Gartenbauwiss.*, xi, 2, pp. 167–182, 9 figs., 2 graphs, 1937.

An account is given of experiments in 1935, the results of which showed that both sweet and sour cherries may develop twig and blossom blight when experimentally infected with conidia of *Sclerotinia cinerea* [*S. laxa*: *R.A.M.*, xvi, p. 190] either through the stigma or through cortical scratches on the shoots, infection in the latter case leading to the failure of the inflorescences above the point of inoculation to set fruit. They also indicated that sour cherries, and particularly the rough cherry [*Prunus cerasus* var. *austera*] are much more severely attacked by the fungus than sweet cherries, a fact which was confirmed by artificial inoculations in 1936 through cortical wounds on 13 varieties of sour and bitter-sweet and 12 varieties of sweet cherries. This work was done as a first step in an investigation of the possibility of developing commercial varieties of sour cherries resistant to the disease by hybridization, and included a number of hybrid seedlings; the results obtained with the latter are not included in this report, because of their strictly preliminary nature. A significant inverse correlation was found between the severity of wilting which resulted from inoculation and the amount of gum exuded at the point of infection, suggesting the possibility that gum may be a factor in the resistance of the less susceptible varieties.

HOFFMAN (M. B.) & EVANS (J. A.). **Handling Strawberry plants to avoid losses.**—*Proc. N.Y. St. agric. Soc.*, *1937*, pp. 267–271, 1937.

The serious losses, ranging in some cases from 50 to 80 per cent. of the plants, from 'root rot' or 'black root' [*R.A.M.*, xv, p. 780] incurred in new strawberry plantings in New York State may, it is considered, have been due to winter injury, following on neglect of mulching [ibid., xiv, p. 180; cf. xvi, p. 394] and the active growing condition of the plants when received from the nursery.

HAAS (R. C.). **Chlorine in relation to ring-neck in Avocado fruits.**—*Yearb. Calif. Avocado Ass.*, *1936*, pp. 60–62, [? 1937. Abs. in *Chem. Abstr.*, xxxi, 11, p. 3961, 1937].

'Ring-neck' usually occurs on avocado fruit stems or pedicels and consists in the development of dry areas separating more or less readily from the living tissue and leaving a scar. The stem half of the pulp or skin contains a larger percentage of total chlorine than the tip half, and the inner portion of the pulp is richer in chlorine than the outer. There is evidence of a relation between the chlorine content of the irrigation water, and of the pulp and skin of the fruit, and the state of health of the trees. The dry matter of the entire fruit pedicels of healthy avocados (Itzamna variety) contained 0·41 per cent. chlorine compared with 0·77 to 1·42 per cent. in the same organs of 'ring-neck' fruits, suggesting that chlorine or other salts may be a factor in the etiology of the disorder.

WARDLAW (C. W.). **Banana diseases. X. Further observations on Cercospora leaf spot of Bananas.**—*Trop. Agriculture, Trin.*, xiv, 4, pp. 117–118, 1937.

Banana leaf spot (*Cercospora musae*) [*R.A.M.*, xvi, p. 545] first recorded in Trinidad at the Maqueripe Estate in 1934, has now spread generally throughout the island. In 1936, production was seriously affected, plants at all stages of development being severely spotted and commercial bunches spoilt by premature ripening, a feature not present in 1935, and apparently one which may not become manifest until severe leaf spotting has been prevalent for some time. The evidence indicates that the leaves can become infected only when or soon after they unroll, this being followed by a fairly long incubation period, with the result that the development of spotting is observable only in the older leaves. The distribution of the spots on the leaf surface indicates that in some instances, at least, a definite relationship exists between intensity of spotting and adverse conditions of growth, particularly those affecting water supply. The most conspicuous symptom of premature fruit ripening is the pinkish pulp of the affected fingers. Some of the vascular strands of the true stem are pale blue, and contain vessels in which pathological symptoms have been or are being induced owing to the diseased state of the leaves. The occurrence of such changes in the true stem and rhizome may have an important effect on the progressive intensification of infection.

GARBOWSKI (L.). **Poland: on the products used in the control of plant diseases and pests.**—*Int. Bull. Pl. Prot.*, xi, 4, p. 68, 1937.

The chemical composition of the fungicides, insecticides, and the like used in Poland is determined by analysis in the phytopathological department of the State Institute of Agriculture, Bygdoszcz, while their practical efficacy is ascertained by means of field tests at the same establishment and at the Institute of Rural Economy, Puławy, with the co-operation of local agricultural and horticultural experiment stations. The importation of certain anticryptogamic products is subject to customs regulations.

ROBERTSON (W. C.). **Fungicides and insecticides. Brands registered for 1937.**—*J. Dep. Agric. Vict.*, xxxv, 4, pp. 195–207, 1 fig., 1937.

Following some explanatory notes a complete list is given of the fungicides, insecticides, and kindred preparations registered at the Office of the Director of Agriculture, Victoria, under the Fungicides Act, 1935 for the year 1937–8, with the percentages of declared active constituents and the names and addresses of the manufacturers or wholesale dealers supplying them.

ANDERSON (H. W.), KADOW (K. J.), & HOPPERSTEAD (S. L.). **The evaluation of some cuprous oxides recommended as seed-treatment products for the control of damping off.**—*Phytopathology*, xxvii, 4, pp. 575–587, 4 figs., 1937.

In these tests to determine the relative merits as seed disinfectants for the control of damping-off (*Pythium* and *Rhizoctonia* spp.) of five brands of cuprous oxide [*R.A.M.*, xvi, p. 549], adequate commercial

reduction of infection in a number of vegetable crops, including lettuce, carrots, beets, peas, onions, various cucurbits, tomato, eggplant, pepper [*Capsicum annuum*], and spinach was obtained with the preparations supplied by Röhm and Haas (cuprocide), Metals Refining Co. (metrox), Mallinckrodt, and Merck, the two first-named being the most effective. A product furnished by the Ansbacher-Siegle Co. was less generally satisfactory, probably on account of the low percentage (25) of active ingredient, whereas the others consisted essentially of pure cuprous oxide. The main points to be considered in the choice of a cuprous oxide are its capacity to afford a smooth uniform coverage to the seed and a high copper content (not less than 95 per cent.). Colour is not a reliable guide to the efficacy or otherwise of a preparation. The material should be fine enough to pass a 325-mesh screen. Under Illinois conditions crucifer seeds should not be treated with copper preparations, which are almost certain to cause injury. Cuprous oxide should not be used in soils more acid than P_H 5. A number of other recommendations and precautions in connexion with the use of the compound are given.

WILLAUME (F.) & BINDER (O.). **Sur les spectres d'absorption par réflexion dans l'ultraviolet de quelques sels basiques de cuivre et autres produits fongicides et insecticides.** [On the spectra of absorption by reflexion in the ultra-violet of some basic salts of copper and other fungicidal and insecticidal products.]—*C.R. Acad. Sci., Paris*, cciv, 18, pp. 1363–1365, 1937.

Samples of copper-containing preparations used as fungicides and insecticides were exposed for five minutes to the rays of a Challonge and Lambray hydrogen tube (2,000 volts, 4 milliampères) emitting wave-lengths up to 2,500 Å. The light from the source was reflected on the experimental substances by a mirror and the spectra registered on Lumière S.E. plates. The wave-lengths recorded for Bordeaux and Burgundy mixtures were 4,080 and 4,100 Å, respectively, no difference being observed between the deposits of Bordeaux samples prepared in various ways.

DUFRÉNOY (J.) & REED (H. S.). **A technic for staining cells with Sudan III in a water phase.**—*Stain Tech.*, xii, 2, pp. 71–72, 1937.

For the study of the spherical inclusions of lipoid material in the plant cell vacuole which constitute one of the most important indices of impaired physiological activities, the following stain was found to be satisfactory. A strong solution of Sudan III was first prepared in 5 c.c. methylal and the mixture poured into a small vial to which was added 10 to 20 c.c. water. After a few minutes the water and methylal separate, leaving the lower, light orange phase containing water+methylal+Sudan III and an upper phase consisting of methylal+Sudan III+water; the aqueous phase is able to carry the Sudan III into the cell without previous killing.

Spherical inclusions of highly refringent phytosterol material have been shown to occur in the hypoplastic cells of orange leaves affected by mottle leaf [*R.A.M.*, xiv, p. 506, and above, p. 605], and similar bodies have been observed in the cells of various Solanaceae and Compositae harbouring the spotted wilt virus [ibid., xvi, p. 285]. Such

bodies, besides staining with Sudan III and other fat-soluble dyes, react by a grey coloration to osmic acid at a low concentration, and by a blue one to nascent indophenol blue, formed as a suspension in a mixture of alkaline solutions of paradiphenylanine hydrochloride and thymol. Using the procedure described above, the writers obtained very satisfactory results with sections of *Callistephus sinensis* leaves affected by spotted wilt, the intravacuolar lipoid spheres having assumed a bright orange tint at the end of 30 minutes' exposure to the stain.

RAPER (J. R.). **A method of freeing fungi from bacterial contamination.**—*Science*, N.S., lxxxv, 2205, p. 342, 1 diag., 1937.

Water mould cultures have been freed from their bacterial contaminants by the following method. A van Tieghem ring, to one end of which are fused three glass beads, $\frac{1}{3}$ to $\frac{1}{2}$ mm. in diameter, is placed in a Petri dish with the beaded rim resting on the bottom. Sufficient nutrient agar is poured into the dish to bring the surface of the medium well up on the ring. On the solidification of the agar a fragment of inoculum is transferred to the area enclosed by the ring. As growth progresses some of the hyphae extend down into the agar, under the ring, and into the agar lying beyond it, while the contaminants are retained at the surface of the semi-solid within the ring. Cubes of agar containing numerous hyphal tips from this outlying portion of the mycelium are therefore bacterium-free and may be used as a foundation for new and perfectly pure cultures.

FERDINANDSEN (C.) & BUCHWALD (N. F.). **Fysiogene plantesygdomme. II. Kemoser.** [Physiogenic plant diseases. II. Chemoses.]—K. vet. Højsk., Kbh., 214 pp., 1936. [Received May, 1937.]

This is a comprehensive discussion, supplemented by copious references to the relevant literature, of the pathological effects on plants of such chemical factors as the excess or deficiency of water, carbon, oxygen, hydrogen, sulphur, phosphorus, potassium, calcium, magnesium, iron, manganese, copper, zinc, boron, and minor elements, industrial smoke, noxious gases, and miscellaneous factory emanations, the toxic constituents of insecticides and fungicides, soil poisoning, e.g., by salt, irrigation, and effluent waters, smoke, gas, toxic compounds in fertilizers and herbicides, metabolic processes, and 'exhaustion' due to fungi, bacteria, virus diseases, shortage of essential nutrients, and other cases.

MUNN (M. T.). **Seed inspection for disease control.**—*Plant Dis. Reptr*, xxi, 7, pp. 121–124, 1937. [Mimeographed.]

Discussing the methods of seed testing for the detection of disease employed by the International Seed Testing Association, the writer finds that insufficient stress is laid on the sanitary condition of the material submitted for inspection and certification. Provision should be made for adequate field inspection, controlled handling of the seed crop, and careful testing by approved means of the finished seed stock, followed either by the issue of a certificate vouching for the apparent absence of seed-borne infection, or if the latter be present, by directions for appropriate treatment. Evidence accumulated during the last few

months indicates that growers are becoming increasingly alive to the need for large-scale seed disinfection [cf. *R.A.M.*, xvi, p. 443], and this welcome trend should be encouraged by the active co-operation of plant pathologists in the work of the seed-testing laboratories. In conclusion, a wider demand for international certificates [cf. ibid., xv, p. 688] is urged as conferring a measure of protection against the spread of disease and serving to focus attention on the importance of sound seed stocks.

AINSWORTH (C. G.). **The plant diseases of Great Britain: a bibliography.**—xii+273 pp., London, Chapman & Hall, Ltd., 1937. 15s. net.

The author has collected, and here presents in the form of an annotated list, the key references in the relevant English and foreign literature to the principal economic plant diseases of Great Britain, with a view to facilitating the rapid assembly of the essential information concerning a given pathogen and its control. As Dr. E. J. Butler points out in his foreword, the previous lack of such a compilation was of considerable inconvenience to the working plant pathologists for whom the present volume is primarily intended. The diseases are listed by their common and scientific names under the main host groups—cereals, fodder and root crops, potato, pulse, vegetables, fruit, ornamentals, trees, and miscellaneous, and author, host, and parasite indexes are provided.

YARWOOD (C. E.). **The relation of light to the diurnal cycle of sporulation of certain downy mildews.**—*J. agric. Res.*, liv, 5, pp. 365–373, 1937.

The author states that microscopical studies carried out under field conditions in California in May, 1935, showed that on the leaves of hop plants infected with downy mildew (*Pseudoperonospora humuli*) the sporangiophores first emerged from the stomata at 12 p.m.; at 3 a.m. the branching of the sporangiophores was complete, and small sporangia had formed; these attained about full size at 6 a.m., and were mature and readily liberated at 9 a.m., at which time they were caught in the largest numbers on spore-trap slides; very few sporangia were caught at night. Experiments further showed that the downy mildews of hop, onion (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xv, p. 468], vine (*Plasmopara viticola*), and lettuce (*Bremia lactucae*) failed to sporulate when infected leaves were exposed to artificial light (170 ft. candles from a Mazda lamp). The hop and onion mildews sporulated most abundantly when infected leaves or plants were placed in darkened moist chambers in the late afternoon and evening, and poorly, or not at all, when the leaves or plants were placed in these chambers in the early morning. Exposure for 12 hours or more to darkness at low humidity and different temperatures also inhibited the capacity to sporulate of the hop and onion mildews, but subsequent exposure to natural or artificial light for 12 hours restored it. These findings are considered to indicate that while the diurnal cycle of sporulation of these two mildews is basically dependent on the alternation of light and darkness in the normal day, the actual nocturnal sporulation is directly

dependent on the darkness and high humidity frequently coincident at night [cf. ibid., xvi, p. 104].

SALAMAN (R. N.). **Plant viruses and their relation to those affecting man and animal.**—*Lancet*, ccxxxii, 5927, pp. 827–833, 1 diag., 1937.

In this interesting and suggestive account (delivered as a lecture before the Southampton Medical Society on 13th January, 1937) of some outstanding recent contributions to the study of viruses [*R.A.M.*, xvi, p. 114], the writer discusses the relationships between those attacking man and animals and the plant group. The paper falls into three main sections: (1) the nature of viruses, comprising observations on the definition, character, size, properties, and variations of the infective principles, and the antigenic and protective reactions of the host towards the invader; (2) reaction to infection, including remarks on the carrier, transference of plant viruses, virus complexes, and typical diseases; and (3) prevention, briefly outlining a few possible lines of approach to the control problem (in plants, more especially potatoes), e.g., cultivation of (*a*) naturally immune varieties and (*b*) carriers, good husbandry, and vaccination.

SAVILE (D. B. O.) & RACICOT (H. N.). **Bacterial wilt and rot of Potatoes.**—*Sci. Agric.*, xvii, 8, pp. 518–522, 3 figs., 1937. [French summary.]

Since 1931 potatoes in several localities in Quebec have shown a condition referred to as 'bacterial wilt and rot' affecting both haulm and tubers [*R.A.M.*, xvi, p. 201]. In the greenhouse the first symptom may be a flagging of individual leaflets during sunny periods. Later the affected leaves may show an upward rolling of the edges, or lesions with yellow margins, finally becoming permanently wilted and shrivelled. The petioles of mature leaves generally remain rigid, but the young petioles and the stem tip may wilt before shrivelling. In the field the symptoms are less conspicuous. Affected tubers display a yellowish or light brown discoloration of the vascular ring spreading from the stolon end, and subsequently there may be a more extensive dark discoloration, general rot, and a separation of the cortex and outer storage parenchyma from the storage parenchyma inside the xylem ring. The affected tissues are crumbly, with the consistency of cooked potato tissue. Slightly affected tubers usually show no external symptoms, but severely affected ones may be cracked or bear reddish-brown discolorations on the skin. Some tubers decay completely, and others continue to show faint symptoms in the spring.

From the vascular ring of slightly affected tubers colonies of a very slow-growing, Gram-positive, rod-shaped bacterium measuring about 0·6 to 0·9 by 0·3 to 0·5 μ were obtained, and inoculations with it into potato stems and tubers reproduced the disease. The organism is very closely related to *Phytomonas michiganensis* [*Aplanobacter michiganense*: ibid., xvi, p. 419] and *Bacterium sepedonicum* [ibid., xv, p. 251], but it is doubtful whether it can be considered identical with either. Inoculations into tomato stems resulted in symptoms closely resembling those of *A. michiganense*.

LITTAUER (F.). **Phytophthora blight of Potatoes.**—*Yedeoth*, iii, 3–4, pp. 84–93, 4 figs., 1937. [Hebrew, with English summary.]

Potato blight (*Phytophthora infestans*), rare during the first years of cultivation in Palestine, has continued to spread since its first appearance, and has assumed an epidemic character in some localities. The increased importation of potatoes adds to the danger of an outbreak, and spread is also favoured by the fact that the area under potatoes is extended during winter and spring, which are the seasons most conducive to the development of the fungus. Tuber infection is found only on imported seed tubers, the disease in its local form attacking only the stems and leaves.

Investigations showed that no disease occurred at temperatures of 25° to 26° C., the optimum being between 13° and 24°. Sudden variations within the optimum range are particularly favourable to the development of the fungus, with the result that spread is most marked during periods with cold nights and warm, humid days [*R.A.M.*, xvi, p. 514]. The fungus was found only in February, March, and the first half of April, after which time spread is arrested by the rising temperature and the hot, dry winds. Potatoes sown between August and October, inclusive, have not yet been affected.

VAN DER PLANK (J. C.). **Internal brown fleck; a phosphorus-deficiency disease of Potatoes grown on acid soils.**—*Sci. Bull. Dep. Agric. S. Afr.* 156, 22 pp., 4 pl., 1 fig., 1936. [Received July, 1937.]

In the form of internal brown fleck of potatoes that occurs in South Africa [*R.A.M.*, iii, p. 603; iv, p. 564] as a result of phosphorus deficiency in the soil, associated with high acidity, the affected tubers show isolated, rusty-brown lesions, up to over 1 cm. in diameter, which may coalesce, and occur in the cortex and pith, sometimes crossing the vascular ring. They are arranged irregularly, though sometimes with a tendency to a radial pattern. Externally the potatoes appear to be normal. The lesions are initiated by the lignification and death of isolated cells, followed by collapse of the surrounding tissue, which is not isolated by a ring of cork.

The disease causes considerable loss and has been observed in all four Provinces of the Union, under different conditions of climate and rainfall, though perhaps most prevalent on the high veld. It is regarded as distinct from similar conditions reported from other countries, as these are not attributed to the same soil factors, though the rusty spot reported from Java [ibid., xv, p. 253] may possibly be an exception, but tubers showing an anatomically similar appearance were received from Southern Rhodesia, Portuguese East Africa, and the Belgian Congo. Slightly flecked tubers may safely be used as seed, but badly affected ones should not be planted, as they are too weak.

Control may be effected by the combined use of lime and superphosphate, the liming being carried out as early as possible before planting. Soils in which the disease is very severe should be avoided.

DYKSTRA (T. P.). **Report on Potato virus diseases in 1936.**—*Amer. Potato J.*, xiv, 4, pp. 117–124, 1937.

This is a brief summary and bibliography of the principal papers

appearing in 1935–6 on virus diseases of potatoes [cf. *R.A.M.*, xv, p. 246].

SMALLCAPS_BALD (J. G.). **An F-type Potato virus in Australia.**—*Nature, Lond.*, cxxxix, 3520, p. 674, 1937.

In January, 1936, a virus carried without symptoms in a number of Solanaceous hosts was recovered from Arran Crest or Arran Pilot potatoes with a slight aucuba foliar mottling at Canberra. No tuber necrosis was observed, but the virus was repeatedly recovered over a period of one year from the tubers of the affected plants, and from F_2 plants grown from them. The presence of the virus failed to protect the plants from infection by Y-type viruses, and various other hosts containing it readily succumbed to X and X+B. Severe necrosis was induced by the potato virus on pepper [*Capsicum annuum*] at 70° F., above and below which the symptoms were milder. *Solanum nigrum* sometimes showed a very faint and transitory vein-clearing or mottle, but usually contained the virus in large quantities without the expression of any external symptoms. The properties of the virus, as far as hitherto studied, correspond with those of the F type [*R.A.M.*, xvi, p. 116].

SCHULTZ (E. S.), CLARK (C. F.), STEVENSON (F. J.), & RALEIGH (W. P.). **Resistance of the Potato to latent mosaic.**—*Amer. Potato J.*, xiv, 4, pp. 124–127, 1937.

The tendency to aerial tuber formation detected by Raleigh in Green Mountain scions containing the latent mosaic virus [*R.A.M.*, xvi, pp. 53, 487], served to determine the reactions to this disease of 203 seedlings of the cross S41956×Katahdin and 135 of S41956×S45075. The data were obtained by inarch grafting of a shoot from each of three seedling tubers on a latent mosaic Green Mountain shoot when the plants were about 15 cm. in height. Some ten days after grafting, the seedling shoots in two of the grafts were cut off above and next to the graft union, so as to leave a latent mosaic top on the seedling stock. The seedling shoots in the third graft were not severed, so that foliage reactions could be observed. Inarched grafts of Katahdin, and of the seedling varieties S41956 and S45075 used as parents, were made on latent mosaic Green Mountain for control purposes. The results were as follows: S41956×Katahdin, 37 per cent. immune, 23 per cent. necrotic, 16 per cent. mottled, and 24 per cent. apparently healthy; S41956×S45075, 37 per cent. immune, 0 per cent. necrotic, 36 per cent. mottled, and 27 per cent. apparently healthy. Sap inoculations from the externally sound progenies of the two crosses on *Datura stramonium* and *Capsicum* sp. showed that the apparently healthy plants carried the latent mosaic virus. The fact that no necrosis developed in the progeny of S41956×S45075 is taken to denote that the latter differs genetically in this respect from Katahdin, 23 per cent. of the offspring of which and S41956 contracted the typical necrotic reactions of Katahdin. Of the controls, all the Katahdin shoots developed top necrosis; one S45075 shoot produced light green foliage and three remained apparently healthy, but were shown by inoculations on *D. stramonium* to harbour the latent mosaic virus. The seedling variety S41956 was immune, as

indicated by the aerial tuber reaction in the latent mosaic Green Mountain scion.

VOLKART (A.). **Sortenwahl und Saatguterzeugung im Kartoffelbau.** [Varietal selection and seed production in Potato cultivation.]—*Schweiz. landw. Mh.*, xv, 1, pp. 2–27, 3 figs., 2 diags., 7 graphs, 1937.

The writer fully describes and discusses the commercial, economic, and scientific aspects of seed potato production in Switzerland, in connexion with which the importance is emphasized of replacing varieties susceptible to wart [*Synchytrium endobioticum*] by immune sorts [*R.A.M.*, xvi, p. 403] and the constant replenishment of seed from mountain-grown stocks to eliminate virus infections [ibid., xiv, p. 786]. From 1940 onwards, by a decision of the (German) Reich Food Board, the cultivation of the wart-susceptible Industrie, Allerfrüheste Gelbe, Centifolia, Duke of York, Early Rose, Wohltmann, and Zwickau, is to be discontinued, the development of suitable indigenous substitutes for which is therefore becoming urgently necessary. There has been a tendency of late years, which is strongly to be deprecated, to include susceptible varieties in the standard Swiss assortment, the only immune ones at the moment being Kaiserkrone (early), Erdgold and Weltwunder (medium-early), Voran (late), and Ackersegen and Jubel (industrial); the last-named, also resistant to scab [*Actinomyces scabies*] and *Phytophthora* [*infestans*], could well be used to replace Centifolia for the table.

[BLAIR (I. D.).] **Deterioration in the Potato.**—*Bull. Canterbury agric. Coll., Lincoln*, 94, 2 pp., 1937.

Degeneration in potatoes in New Zealand is mainly due to virus diseases, including leaf roll, mosaic, crinkle, and stipple streak [*R.A.M.*, xvi, p. 552], but also to *Verticillium albo-atrum*, *Erwinia atroseptica*, and *Bacterium solanacearum*. *Actinomyces* [*scabies*], *Spongospora subterranea*, and *Corticium solani* may so disfigure the tubers as to render them unmarketable. Dry rot (*Fusarium* spp.) [*F. orthoceras* and an unidentified *F.* species: ibid., xiv, p. 466] is a major problem in New Zealand, but its incidence can be reduced by the avoidance of mechanical injury during digging, grading, and transit, and of contamination from diseased tubers in the sheds. Owing to the masking of virus symptoms in some varieties high quality seed can be maintained only by growing different varieties some distance apart. Transmission often occurs through *Solanum nigrum*. No commercial varieties are resistant to both leaf roll and mosaic; Iron Duke may carry high resistance to mosaic, but is extremely susceptible to leaf roll.

The certification of seed potatoes by the New Zealand Department of Agriculture [ibid., vii, p. 389; xv, p. 44] is restricted to disease-free seed. Two standards of certified seed are available, commercial and mother seed, of which the former is ineligible for re-entry into certification, while the latter, which commercial growers of certified seed are required to purchase, includes only the best lines.

The prevention of potato degeneration depends on disease control, and this in turn on crop rotation, proper handling, and the use of certified seed.

TOCHINAI (Y.) & SAKAMOTO (M.). **Studies on the physiologic specialization in Ophiobolus miyabeanus Ito et Kuribayashi.**—*J. Fac. Agric. Hokkaido Univ.*, xli, 1, pp. 1–96, 3 pl., 2 figs., 1 diag., 1937.

An exhaustive, fully tabulated account is given of the writers' studies on physiologic specialization in *Ophiobolus miyabeanus* [*R.A.M.*, xvi, p. 490], one of the most destructive pathogens of rice in Japan.

Monospore cultures of 132 strains of the fungus were grown on four differential media, viz., rice culm decoction, potato decoction, Saito's soy, and Richards's nutrient agars. The optimum temperature for development was found to range from 25° to 30° C. on Saito's soy agar. Saltation, both of the sector and patch types, was of frequent occurrence in several strains. In some cases the characters of the saltants persisted in the progeny through ten generations of reculture, whereas in others complete reversion to the parent forms took place. Morphological variations in the shape of the conidia were observed among the strains on rice culm decoction agar, stout types ($94{\cdot}36 \pm 0{\cdot}66$ by $18{\cdot}59 \pm 0.09\,\mu$) being produced by biologic races I, II, and III, and slender ones ($91{\cdot}00 \pm 0{\cdot}63$ by $17{\cdot}00 \pm 0{\cdot}10\,\mu$) by IV. These distinctions were not apparent on potato decoction agar.

In inoculation experiments representatives of the ten growth types into which the 132 strains were classified differed in their pathogenicity to 15 rice varieties, some biologic races being extremely virulent, others only moderately or weakly so. The Omachi No. 2, Tokachi-kuroke, Sensho, Kamenoo, Bozu No. 5, and Kairyo-shinriki varieties were resistant, while Hashiri-bozu and Kairyomochi No. 1 proved very susceptible to most strains of *O. miyabeanus*. Races VIII and X did not attack cereals, the remaining eight caused more or less severe infection of maize and naked barley, while wheat, common barley, rye, and oats were comparatively resistant.

A bibliography of 64 titles is appended.

TEODORO (N. G.). **An enumeration of Philippine fungi.**—*Tech. Bull. Philipp. Dep. Agric.* 4, 585 pp., 1937.

This is an annotated list of all known Philippine fungi and references to species credited to the Archipelago in publications appearing prior to January, 1935 [cf. *R.A.M.*, ii, p. 141; vi, p. 365; xi, p. 268; xvi, p. 209].

MAUBLANC (A.). **Contribution à la connaissance de la flore mycologique du littoral Atlantique.** [A contribution to the knowledge of the mycological flora of the Atlantic seaboard.]—*Rev. Path. vég.*, xxiv, 2, pp. 121–132, 2 figs., 1937.

In this annotated list of Peronosporales, Ustilaginales, and Uredinales collected by the author on the French Atlantic seaboard mention is made of *Puccinia porri* [*R.A.M.*, xv, p. 745] found on leeks.

HOMMA (YASU). **Erysiphaceae of Japan.**—*J. Fac. Agric. Hokkaido Univ.*, xxxviii, 3, pp. 183–461, 8 pl., 7 figs., 1937.

In the first part of this monograph dealing with all the Japanese species of Erysiphaceae the author gives the results of her biological and morphological studies on these fungi.

From the evidence obtained it is concluded that in all the genera of the Erysiphaceae the conidia are produced in a chain, though in *Uncinula, Microsphaera, Erysiphe* (*Polygoni* section), *Phyllactinia, Uncinulopsis*, and *Leveillula* two or three immature conidia are always present beneath a single mature spore. *Cystotheca* is considered to show the most simply constructed perithecium, while *Uncinulopsis* and *Phyllactinia* have the most complex.

When the conidia of *E. graminis* f. sp. *tritici* [*R.A.M.*, viii, p. 433; xiv, p. 711] were inoculated on wheat varieties immune from and susceptible to the fungus the infection tube penetrated into the cell wall of the epidermis in all the varieties, but haustoria were formed only in the susceptible ones. Inoculations of wheat in different stages of growth with the conidia showed that infection did not take place either in the early growing or late senile stages, that mycelial growth was most vigorous in the mature stage, and that perithecia generally formed in the early senile stage. *Triticum dicoccum*, Emmer 3933, Khapli 6400, *T. boatum*, and Russian No. 38 were immune from *E. graminis* f. sp. *tritici* collected in an experimental field; of other wheat varieties tested the susceptible were distinguished from the resistant by different morphological leaf characters, highly susceptible varieties showing few hairs on the surface and few thick-walled epidermal cells, and resistant varieties the opposite. As a result of a series of inoculation experiments with *E. graminis*, the author concludes that the existence of a bridging form in this mildew must be recognized, *Triticum dicoccum* var. *farrum* being the bridging species between *T. vulgare* and *T. monococcum* var. *hornemanni*. The conidia on *T. vulgare* are longer and form longer and more slender germ-tubes than those on *T. dicoccum* var. *farrum*.

In the second part of this paper annotated diagnoses are given of 74 powdery mildews belonging to 11 genera found in Japan. Among the new species recorded are *Uncinula bifurcata* on oats, *U. betulae* on birch, *Sawadaea negundinis* on *Acer negundo*, *Microsphaera ligustri* on *Ligustrum ovalifolium*, and *M. coryli* on *Corylus*. *Erysiphe pyri* on pear is renamed *Phyllactinia pyri* (syn. *P. suffulta* f. *pyri* Rehm).

DAHNKE (W.). **2. Nachtrag zur Flora von Parchim und Umgebung** [Second addendum to the flora of Parchim and environs.]—*Arch. Ver. Naturg. Mecklenb.*, N.F., x (*1935*), pp. 17–34, 1936. [Received June, 1937.]

The following are among the fungi observed by the writer in the Parchim district of Mecklenburg in 1935: *Entyloma calendulae* prevalent on *Calendula officinalis* [*R.A.M.*, xvi, p. 515], *Cronartium ribicola* on black currant [ibid., xiv, p. 617], *Endophyllum sempervivi* on *Sempervivum tectorum* [ibid., xv, p. 510], *Fomes fomentarius* on beech [ibid., xv, p. 473; cf. also xvi, p. 4], and *F. nigricans* on *Salix*.

SPRAGUE (R.). **Undescribed species of Cercosporella and Cercospora on certain grasses in Oregon and Washington.**—*Mycologia*, xxix, 2, pp. 199–206, 3 figs., 1937.

Notes, with Latin diagnoses, are given on three new species of *Cercospora*-like fungi found on grasses in the United States, viz., *Cercosporella holci* n. sp. (alternatively *Cercospora holci* n. sp. if the genus

Cercosporella is not recognized) on *Holcus lanatus* in the field, *Cercosporella subulata* n. sp. (*Cercospora subulata* n. sp.) on herbarium material of *Melica subulata* (Griseb.) Schribn., and *Cercospora bromi* n. sp. (*Cercosporina bromi* n. sp.) on *Bromus rigidus* Roth in the field.

DRECHSLER (C.). **New Zoopagaceae destructive to soil rhizopods.**—*Mycologia*, xxix, 2, pp. 229–249, 6 figs., 1937.

Full descriptions, with Latin and English diagnoses, are given of three new species of *Cochlonema* and one of *Zoopage* predacious on soil rhizopods in the United States [*R.A.M.*, xvi, p. 176], viz., *C. odontosperma* n. sp., occurring in leaf mould, infecting and consuming amoebae, *C. megaspirema* n. sp., occurring as a destructive parasite of *Amoeba terricola* (sensu strictiore) in partly buried, decaying tomato leaves, *Z. tryphera* n. sp., occurring in leaf mould, capturing and consuming *Geococcus vulgaris*, and *C. cylindricum* n. sp., parasitic on *Euglypha denticulata*, and occurring in decaying tomato roots.

HEUBEL (G. A.). **Beknopt overzicht van de Rubber- en Theecultuur in het rayon Buitenzorg gedurende 1936.** [A condensed survey of Rubber and Tea cultivation in the Buitenzorg area during 1936.]—*Bergcultures*, xi, 14, pp. 475–480, 1937.

Ganoderma pseudoferreum was responsible for the chief damage to *Hevea* rubber roots in the Buitenzorg district of Java [*R.A.M.*, xi, p. 72; xiii, p. 687] in 1936. The best method of arresting the spread of infection is to expose the root-collars of trees in threatened areas. *Phytophthora palmivora* [ibid., xv, p. 345] was prevalent, and *Corticium salmonicolor* [ibid., xiv, p. 152] occurred in a widespread and serious form. *Diplodia* and *Ustulina zonata* [ibid., xiii, p. 56] caused damage among grafts. A mixture of milk of lime and 3 per cent. izal or 5 to 10 per cent. carbolineum plantarium has been found useful in the prevention of infection of the tapping surface, but if wounds are present or *P. palmivora* develops in a severe form, a combination of Product Socony 2295 A and 3 per cent. carbolineum plantarium exerts a strong curative action.

G. pseudoferreum was again in evidence in tea plantations [ibid., xii, p. 278], where its extension may be curtailed by exposing the root-collars of the healthy bushes adjoining the circular trench surrounding an infection focus. It is of great importance to keep the trench intact to prevent the passage of infection to the healthy sites outside. Pruning in infected gardens is another source of fresh outbreaks of red root.

GADD (C. H.). **The treatment of Poria root disease of Tea.**—*Tea Quart.*, x, 1, pp. 36–45, 4 diags., 1937.

Examples are given of the application of an improved method for the control of the root disease of tea caused by *Poria hypolateritia* [*R.A.M.*, xv, p. 747; xvi, p. 129] based on the removal of every diseased bush. As most of these appear to be healthy above ground a ring of healthy bushes is removed as well. The soil is cleared of all roots and woody material, and diseased parts are carried away in closed sacks. Trenching is uneconomical, as all the bushes in the enclosed area become infected and die, and meantime the trenches require to be maintained

in perfect order, and the replanting of the diseased area is delayed. Trenches should be regarded as only a second line of defence. Locally, they are very inefficient, and could be safely abandoned if every affected bush were removed.

One area in which the disease is believed to have been eradicated by the new method lies at the edge of a ravine where infected bushes have previously been burnt. In August, 1935, one dead and two sickly bushes and eleven vacancies, each with a diseased tea stump, were found, all of which were removed. Surrounding bushes were uprooted until every diseased bush and a whole ring of healthy ones had been dug out. The entire area was then replanted with *Tephrosia vogelii*. In June, 1936, a few of these plants were found to be dead, with *P. hypolateritia* on the roots. These were removed, the source of infection being discovered in a few tea roots that had been overlooked. The plot is to be planted with tea next year.

GADD (C. H.). **Report of the Mycologist for 1936.**—*Bull. Tea Res. Inst. Ceylon*, 17, pp. 23–30, 1937.

This report contains the following items of interest apart from those already noticed from other sources [see preceding abstract]. During 1936, there was a marked increase in the number of tea bushes in Ceylon reported as killed off by brown root rot (*Fomes noxius*) [*R.A.M.*, xv, p. 610; xvi, p. 129]. Where shade trees, particularly *Grevillea*, are felled in large numbers, there is considerable risk that the disease may develop. On one estate where about 6,000 healthy *Grevillea* trees had been cut down, brown root rot began to appear two years later, and over 3,000 bushes had to be removed. Owing to the great rapidity with which *F. noxius* infects the shade stumps and passes to the tea, the former should be eradicated immediately after felling.

Extensive spread of *Rosellinia arcuata* [loc. cit.] occurred on an estate where the soil surface was covered by a thick layer of fallen leaves, and as the fungus can grow freely through leaf mould, the ground at the perimeter of any treated area must be kept free from leaves. There is small danger of the fungus spreading through the mulch in dry weather, but in the wet season the mulch should be kept away from the main stems of tea bushes on estates where the disease occurs.

A new tea disease referred to as 'phloem necrosis' has occurred in one locality; the affected bushes are dwarfed and non-yielding, and have small, hard, distorted leaves, those at the ends of the branches being crowded together. In advanced stages the bushes bear only a few thin branches, which also have small, distorted leaves. In cross section the leaves are V-shaped (though some types of healthy bushes show this character); they are also arched backwards, and sometimes so conspicuously curled that affected bushes can be recognized from a distance. The bushes with markedly curled leaves have longer internodes than others. Recovery from pruning is often poor. As a rule no marked yellowing of the leaves is present. The most conspicuous symptom is the presence of yellow-brown or dark brown spots seen when the woody roots, which outwardly appear normal, are sliced through the cortex so that the cut passes very close to the cambium or just touches the wood. The cause of the disease has not yet been ascertained.

Another type of non-productivity is polyclady, characterized by a prolific development of small, whippy branches from below the ground. The bushes appear like very compact tufts, the leaves are small and hard, and the branches wiry and very close together. There is little indication of a main frame, and the roots turn upwards and give rise to numerous branches. Many form upright, wiry stems, but others remain underground as white, spiral stems. No explanation of the condition is at present available; some affected bushes also show phloem necrosis.

The fungus previously reported as causing a leaf spot of *Crotalaria* [*anagyroides* and *C. usaramoensis*: ibid., xv, p. 747] was identified as *Ceratophorum setosum* [ibid., xvi, p. 515]. Inoculation tests showed that the Ceylon strain attacks *Lupinus polyphyllus* as readily as the European strain, the two strains also giving similar results when inoculated on to the leaves of *C. usaramoensis*.

Tephrosia radicans was severely attacked by *Cercosporella theae* [ibid., xiii, p. 216], the conidia of which were ascertained to attack tea flush as readily as those of the tea and acacia strains. The *T. radicans* stems showed perithecia of a species of *Calonectria* similar to that previously reported in pure cultures of *Cercosporella theae* from tea leaf; similar perithecia were obtained in pure cultures of *C. theae* from *T. radicans*.

Berkeley (G. H.). **Prevention of Tobacco mosaic in Ontario.**—*Circ. Dep. Agric. Can.* 119, 7 pp., 7 figs., 1937.

The following are among the practices recommended for the control of tobacco mosaic in Ontario [*R.A.M.*, vii, p. 347]. Seed-beds should be steam-sterilized, the operation being continued for at least 30 minutes after a temperature of 150° to 212° F. is reached at the lowest depth required. Old boards should be disinfected either by ten minutes' exposure to steam or sprayed with a 2 per cent. solution of formalin and covered with wet papers or canvas for 24 hours, and old cloths boiled for ten minutes. On no account must mosaic seedlings be transplanted to the field, where the percentage of infection may increase from 1 to 80 by harvest time through cultural operations. Experimental results at Delhi (Ontario) have shown that up to 30 per cent. mosaic may develop in the field through the use of tobacco in any form by workers during transplanting. Crop rotation is indicated, experiments at Delhi in 1935–6 having shown that 28 and 17 per cent. mosaic, respectively, occurred in tobacco crops following tobacco, compared with only 1 per cent. in those planted on new ground or following rye [ibid., xvi, p. 500]. Similar results were obtained at St. Catharines, where 10 per cent. mosaic developed on tobacco following tobacco and only 1·5 per cent. on new ground. The importance of roguing is apparent from recent observations at Delhi, where the spread of mosaic in 1935 in a block in which all the diseased plants were rogued before cultivating amounted to only 2·5 per cent., compared with 16 per cent. in an untreated plot. In 1936, in a plot containing 2 per cent. mosaic rogued before the first two cultivations only there was an increase of 2·5 per cent., as against 23 per cent. in an untreated control plot. Plants should not be re-set in soil from which mosaic plants have recently been rogued; 36 per cent.

of healthy plants so treated contracted the disease at Delhi in 1935. In topping, suckering, &c., all healthy plants should be treated as a separate group, leaving the diseased material until later. At Delhi in 1936, in an uncultivated plot with 2 per cent. mosaic in which all healthy plants were topped first, the incidence of infection increased by only 7·6 per cent., whereas in a similar plot where the operation was performed at random, there was an increase of 21·4 per cent. At St. Catharines in 1936 the amount of disease increased by 17·5 per cent. in a plot where the healthy plants were topped first and by 28·2 per cent. where indiscriminate treatment was practised. Implements contaminated by use in a mosaic plot were experimentally shown at Delhi to cause up to 50 per cent. infection in a healthy plot.

BERKELEY (G. H.). **Tobacco diseases in Canada.**—*Plant Dis. Reptr*, xxi, 7, p. 112, 1937. [Mimeographed.]

During the last two years three seedling diseases new to Canada have been discovered by [L. W.] Koch, namely, black leg [*Erwinia aroidea*: *R.A.M.*, xvi, p. 214], frenching [ibid., xvi, p. 412], and root knot [*Heterodera marioni*]; while another, a brown root rot apparently new to science, is prevalent in steamed plant beds, where it is characterized by stunting and general chlorosis.

Other seed-bed disorders were black root rot [*Thielaviopsis basicola*: ibid., xv, pp. 178, 449; cf. also xvi, pp. 130, 348, *et passim*], damping-off [*Pythium* and *Rhizoctonia* spp. including *R.* [*Corticium*] *solani*: ibid., xv, p. 178; cf. also xvi, p. 412 *et passim*], chlorosis of obscure origin, and fleshy fungi (*Coprinus* spp.). In the field the incidence of mosaic [see preceding abstract] was generally lower in 1936 than in 1935, though up to 75 per cent. was recorded in individual fields. Brown root rot was severe only where tobacco followed timothy [*Phleum pratense*] or maize; the Harrow Velvet, Yellow Mammoth, and White Stem Willow Leaf varieties were the most susceptible to this disease, White Mammoth and Bonanza being resistant. *T. basicola* was most severe on Kelley, causing little damage to Harrow Velvet. Various physiological troubles, including sand drown [ibid., xii, p. 146] were reported from different localities. Angular leaf spot and wildfire [*Bacterium angulatum* and *Bact. tabacum*: ibid., xvi, p. 566] occurred in Quebec.

CALDWELL (J.) & SMITH (K. M.). **An air-borne plant virus.**—*Nature, Lond.*, cxxxix, 3522, pp. 761–762, 1937.

In the first of two notes under this title J. Caldwell questions whether K. M. Smith's 'air-borne' virus [tobacco necrosis: *R.A.M.*, xvi, p. 570] actually does reach the air from the tissues of a living infected plant, or that, having done so, it is capable of attacking normal healthy plants. In reply K. M. Smith states that infection of tobacco plants from the air has been experimentally proved under controlled conditions by spraying the virus into the surrounding air from an atomizer. Numerous lesions on French bean (*Phaseolus vulgaris*) leaves have further been induced by the same means. Whether the virus enters through broken hairs or minute wounds, such as are generally supposed to be essential to virus penetration, is not clear at the present stage of the investigations.

MacClement (W. D.). **An improved method of inoculating plants with virus for the study of local lesions.**—*Parasitology*, xxix, 2, pp. 266–272, 1 diag., 2 graphs, 1937.

An account is given of an investigation of the causes of error in estimating virus concentrations by the local lesion method. The inoculum used in the trials consisted of a 'green' strain of tobacco mosaic (Jensen's tobacco virus 1) isolated from Jensen's yellow tobacco mosaic [*R.A.M.*, xvi, p. 496] and the test plants were *Nicotiana glutinosa*. Discrepancies were found to arise through variations in (1) the response of (*a*) whole plants, (*b*) individual leaves; (2) the volume of liquid used; (3) the probability of the production of local lesions; and (4) the percentage of leaf hairs broken in inoculation. These irregularities may be reduced to a minimum by the use of an apparatus in which a small ground glass spatula is rotated against the leaf surface. The maximum number of local lesions is produced when the pressure of the spatula is adjusted so as to break all the leaf hairs near their bases without marking the epidermis. With this apparatus a very small amount of inoculum is required (0·001 c.c. for a spatula with a circular head ½ in. in diameter), which is placed on the leaf by means of a 0·02 c.c. glass pipette. By this method up to 25 separate inoculations can be made on a large leaf, the average number being 12 so that an entire experiment can be conducted on one plant. The writer has found that, with this apparatus, experiments formerly requiring three months can be performed in three weeks, the variation in results being less than 10 to 20 per cent.

Stanley (W. M.). **Some biochemical investigations on the crystalline Tobacco-mosaic virus proteins.**—*Proc. Amer. phil. Soc.*, lxxvii, 4, pp. 447–453, 1 pl., 1937.

Some outstanding contributions to the knowledge of the nature and properties of the crystalline tobacco-mosaic virus proteins [*R.A.M.*, xvi, p. 569, and next abstract] are briefly summarized and discussed. Most of the work is of recent date and has been noticed from time to time in this *Review*.

Wyckoff (R. W. G.). **The ultracentrifugal study of virus proteins.**—*Proc. Amer. phil. Soc.*, lxxvii, 4, pp. 455–462, 3 pl., 1937.

An air ultra-centrifuge of a stable air turbine type with pendant rotors, as developed by Beams (*Rev. sci. Instr.*, vi, p. 299, 1935, *et passim*) from Svedberg's original design (*Naturwiss.*, xxii, p. 225, 1934), is stated to be affording valuable assistance to the writer and his collaborators in two branches of virus study—so far restricted to tobacco mosaic [*R.A.M.*, xvi, p. 346] but presumably capable of extension. In the first place, analytical runs with it, besides furnishing a measure of the size of the virus molecules (*c.* 35 $\mu\mu$), give indications of the degree of purity of a given preparation, the molecular weight of its impurities, its position as a single molecular species or as a part of a family of related proteins [see preceding abstract], and the like. Secondly, runs in which large volumes are ultra-centrifuged in fields sufficiently great to sediment any of the known viruses provide the basis for a method of preparing pure virus protein without recourse to chemical treatment, thereby

opening up the way to a study of viruses which, unlike that of tobacco mosaic, are relatively unstable or present only in minute quantities.

BEST (R. J.). **Visible mesomorphic fibres of Tobacco mosaic virus in juice from diseased plants.**—*Nature, Lond.*, cxxxix, 3519, pp. 628–629, 1 fig., 1937.

The author reports the direct observation, in the protein sediment deposited during several months' storage at about 1° C. in clarified juice from mosaic-diseased tobacco plants, of long fibres, the presence of which had been deduced by Bawden *et al.* in their recent communication on liquid crystalline substances from virus-infected plants [*R.A.M.*, xvi, p. 346]. When undisturbed, the fibres appeared to be several cm. long and fairly flexible, their individual width being of the order of 1 μ; when mounted under cover slips, however, they usually broke up into fragments 2 to 5 mm. in length. With polarized light they suggested a terraced structure in one direction. Gentle agitation of the suspension reduced the fibres to the appearance of short, straight needles or rods, and violent shaking reduced the greater part to a state where they were no longer visible, but standing the suspension undisturbed after shaking reversed the process, the long, satin-like fibres being reconstituted at the bottom of the tube. Moderate dilution reduced the fibres to a state below visibility.

The fact that the fibre-containing protein deposit contained 97 per cent. of the infective principle, together with the fact that when the suspension was heated, the fibrous material at a temperature of just below 92° C. was abruptly changed to a clumped, coagulated mass which floated to the surface, this change being apparently irreversible and coinciding with the thermal inactivation point of tobacco mosaic virus, is considered to be strongly suggestive of the identity of the fibres with the infective principle, a view which is further supported by the fact that the fibres are not formed in the expressed juice of healthy plants stored under the same conditions. It seems a fair conclusion that these mesomorphic, flexible fibres consist of long chains of virus particles linked together by relatively feeble bonds.

GIGANTE (R.). **La laciniatura da virosi delle foglie di Pomodoro.** [Virus-caused laciniation of Tomato leaves.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvii, 1, pp. 87–120, 1 pl., 18 figs., 1937.

The results are given of a histological and cytological study of tomato plants in Italy showing symptoms of fern-leaf [*R.A.M.*, xiv, p. 681; xv, p. 614, and next abstract], for which the author prefers the term 'virus-caused laciniation', as constriction of the leaf blade causing laciniation in the strict sense of the word was a constant symptom, whereas fern-leaf formation was not. Three types of enations were observed, viz. (1) verruciform, produced by hypertrophied epidermal cells, which may be arranged in two or three layers; (2) ridge-like excrescences consisting of a proliferation of subepidermal tissues covered with hypertrophied epidermal cells; and (3) lamellary enations, having the same anatomy as the leaves. The chloroplasts in affected leaves are sometimes smaller than normal. Intracellular (X) bodies, 6 to 13 μ in diameter, were present in close proximity to the nucleus, in the palisade and spongy

tissues of the leaves, and in the cortical parenchyma of the leaf stalks.

In artificial inoculation experiments the disease was transmitted from affected to healthy tomatoes by means of infected juice and grafting, and to White Burley tobacco by rubbing the leaves with infected tomato material. As the inoculations on tobacco produced definite leaf malformations as well as annular necrotic spots, symptoms not produced on this host by cucumber virus 1 [ibid., xvi, p. 132], the author concludes that under Italian conditions some other virus or viruses in addition to this one are responsible for the condition.

RIEHM (E.). **Das Pflanzenschutzgesetz.** [The Plant Protection Act.]—*Angew. Bot.*, xix, 2, pp. 97–101, 1937.

A brief retrospect is given of the various stages in the development of organized plant protection in Germany, culminating in the Reich Act for the Protection of Economic Agricultural Plants of 5th March, 1937 [*R.A.M.*, xvi, p. 576], the provisions of which are regarded as eminently suited to their purpose.

Union of South Africa Proclamations 282, 283, 284, 285, 286, 287 of 1936.—*Govt Gaz., Pretoria*, cvi, 2392, pp. 447–453, 1936. [Received May, 1937.]

The six proclamations (282 to 287, inclusive) of which the text is here given cover the quarantine restrictions against plant diseases at present (as from 6th November, 1936) existing in South Africa, earlier regulations under the Agricultural Pests Act [*R.A.M.*, iii, p. 752] being hereby repealed. Proclamation No. 286 prohibits the introduction into the Union of (*a*) apples, pears, quinces, or loquats from Japan, China, Manchukuo, or Eastern Siberia; (*b*) any plant or seed of any species of *Castanea* from North America or any other country known to harbour chestnut blight (*Endothia parasitica*); (*c*) similar material of *Ulmus* from Europe or any country where *Graphium* [*Ceratostomella*] *ulmi* has been found; (*d*) any tea plant or seed from India, Japan, or any other country where blister blight (*Exobasidium vexans*) occurs, unless accompanied by an official certificate guaranteeing the absence of the disease from a ten-mile radius of the place of cultivation; (*e*) tomato seed from Germany, Italy, North America, or other countries harbouring bacterial canker (*Aplanobacter michiganense*), unless accompanied by a health certificate, and rose plants from North America, Australia, or other countries in which a virus disease of roses is known to occur, the certificate proviso being applicable in this case also.

Duly authorized certificates must further accompany, *inter alia*, all consignments of (*a*) pome fruits (including ornamentals of *Pyrus* and related genera) from overseas, the Mandated Territory of South-West Africa, Portuguese East Africa, or any African State or territory north of the Zambesi, except Northern Rhodesia, Nyasaland, and the Belgian Congo, vouching for the absence of *Bacillus amylovorus* [*Erwinia amylovora*] from the place of cultivation; and (*b*) potatoes from the same countries stating that wart disease (*Synchytrium endobioticum*), at a date not exceeding 30 days before the time of dispatch, was not known to exist within five miles of the place of cultivation.

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McDONALD (W. J. B.). **The utilization of benzol in the Tobacco industry.**—*J. Dep. Agric. Vict.*, xxxv, 4, pp. 157–160, 3 figs., 1937.

Replies to a recent questionnaire as to the efficacy of the benzol vapour treatment of tobacco seed-beds against downy mildew or blue mould [*Peronospora tabacina*: *R.A.M.*, xvi, p. 284] show that the consensus of opinion among growers in Victoria is favourable to this method of control, which was employed during the 1936–7 season over some 5,000 sq. yds., at an average cost of 1*s*. 5½*d*. per sq. yd., with generally satisfactory results. In districts where the disease is prevalent early plantings (second to third week of October) mostly withstood infection better than the later ones. Blue mould losses tend to be more severe on light sandy soils than on the heavier types of land. The Dungowan variety has latterly proved more resistant to the disease than Hickory Pryor.

CICCARONE (A.). **Una virosi del Pomodoro. (Nota preliminare.)** [A virus disease of Tomato. (Preliminary note.)]—*Riv. Pat. veg.*, xxvii, 3–4, pp. 73–77, 1 fig., 1937.

In April, 1936, Perfection tomatoes grown at Palermo from English seed developed symptoms of fern leaf [*R.A.M.*, xvi, p. 639]. The young leaves were much dwarfed (in some cases being only a thin border round the midrib), contorted, thickened, brittle, and sometimes deeply laciniated. Most of the flowers dropped before they opened, and those that remained attached were malformed and gave malformed fruits. New shoots were put out and the fern-leaf symptoms gradually disappeared, the plants showing by the end of May mosaic symptoms similar to those on other tomato varieties in the vicinity. No fruits were set, and the plants finally wilted. As tomatoes grown from the same seed in other localities were reported to have been similarly affected, the author considers that fern leaf may be seed-borne.

NEWTON (W.) & EDWARDS (H. I.). **Virus studies. III. Tomato diseases.**—*Canad. J. Res.*, xv, Sect. C 4, pp. 162–167, 1937.

A survey in 1936 of the commercial glasshouses of Vancouver Island and the lower Fraser Valley in British Columbia showed that tomatoes grown in them are attacked by single virus streak, mixed virus streak, yellow or aucuba mosaic (tobacco virus 6) [*R.A.M.*, xiv, p. 261; xvi, p. 66], and potato streak virus X [ibid., xvi, p. 285], of which the first-

named is by far the most common disease. There appeared to be several strains of this virus, three forms producing symptoms characterized by leaf distortion (fern leaf) [see preceding abstract], necrosis and mottle, and mottle only, respectively. It was shown that this virus is serologically distinct from tobacco viruses 1 and 6, although there was an indication of a distant relationship with the former. While streak X occurred less frequently in the glasshouses than single virus streak, it was found to be economically important, since in many houses less than half the plants yielded marketable fruit owing to this disease. No case of tomato mosaic (tobacco virus 1) was found during the survey, although the virus is quite common on tobacco in British Columbia. Aucuba mosaic was determined in only one case. Mixed virus streak (due to single virus streak+potato virus X) occurred twice in the glasshouses in 1936 and though quite pathogenic is comparatively rare. It caused local lesions on *Nicotiana glutinosa* followed by a mottle, and is thereby readily distinguishable from single virus streak.

KORDES (H.). **Die Anfälligkeit der einzelnen Tomatensorten Bacterium michiganense entgegen und Versuche zur Verhütung der Weiterverbreitung dieses Erregers.** [Susceptibility of individual Tomato varieties to *Bacterium michiganense*, and experiments on the control of the further spread of this pathogen.]—*Gartenbauwiss.*, xi, 2, pp. 231–236, 3 figs., 1937.

After stating that the great majority of the more important commercial varieties of the tomato in Germany have been shown both experimentally and by field observations to be more or less susceptible to *Bacterium* [*Aplanobacter*] *michiganense* [*R.A.M.*, xvi, p. 628], the author expresses the view, based on his own experience, that most of the field spread of the organism is caused by the pruning or pinching off of the side shoots. A confirmation of this view was obtained in experiments, in which this spread was prevented by the careful disinfection of the pruning knife in formalin before passing from one tomato plant to the next, but in practice this procedure proved uneconomical, and consequently was not adopted by the growers. With the object of removing this drawback, in 1933 the author tried breaking off the shoots at as early a stage of development as feasible instead of pruning them out, and by this means he claims to have been successful in preventing the spread of the disease without undue injury to the plants; the method is now being increasingly adopted by tomato growers in the Palatinate.

BUHR (H.). **Pflanzengallen Mecklenburgs. III.** [Plant galls of Mecklenburg. III.]—*Arch. Ver. Naturg. Mecklenb.*, N.F., x (*1935*), pp. 35–51, 1936. [Received June, 1937.]

Among the fungal and bacterial plant galls of Mecklenburg enumerated in this annotated list may be mentioned *Taphrina aurea* [*R.A.M.*, xvi, p. 563] and *T. johansonii* [ibid., vi, p. 177] on poplars, *T. ulmi* on elms [ibid., viii, p. 630; xv, p. 745], *T.* spp. on a number of fruit and forest trees, *Microstroma juglandis* forming small, vesicular outgrowths on young walnut (*Juglans regia*) leaves [ibid., xv, p. 74], and *Protomyces macrosporus* [ibid., xii, p. 73] on carrots.

SCHWERDTFEGER (F.). **Die wichtigeren forstpathologischen Arbeiten des Jahres 1936. Kritische Übersicht.** [The outstanding investigations on forest pathology in the year 1936. A critical survey.]—*Forstarchiv*, xiii, 8, pp. 133–142, 1937.

This is a list, supplemented by brief critical observations, of the principal investigations on forest pathology in Germany in 1936 [cf. *R.A.M.*, xv, p. 615]. Most of the papers cited deal with entomological researches; those relating to fungal diseases of trees have been noticed in this *Review*.

FRON (G.). **La maladie de l'Orme.** [The Elm disease.]—*Rev. Eaux For.*, lxxv, 3, pp. 193–200, 4 pl., 1937.

The writer's report on the favourable preliminary results of his experiments in the control of the elm disease (*Ceratostomella ulmi*) in France by means of cryptonol or sunoxol has already been noticed from another source [*R.A.M.*, xvi, p. 350].

WESTERDIJK (JOHANNA). **Die Notwendigkeit der Anfälligkeitsprüfungen unserer Laub- und Nadelhölzer.** [The necessity of susceptibility tests of our broad-leaved and coniferous trees.]—*Angew. Bot.*, xix, 2, pp. 119–126, 1937.

The author cites some striking examples of fungal epidemics affecting soft and hardwoods in Holland, in which connexion the importance of extensive varietal reaction tests, comprising inoculations under widely differing environmental conditions, in the development of resistant types is emphasized.

WENT (JOHANNA C.). **Verslag van de onderzoekingen betreffende de Iepenziekte, verricht in het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn gedurende 1936.** [Report on the Elm disease investigations conducted in the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1936.]—*Tijdschr. PlZiekt.*, xliii, 4, pp. 75–90, 1937.

Further studies were carried out in Holland in 1936 on the varietal susceptibility of selected elm seedlings to *Ceratostomella ulmi* [*R.A.M.*, xv, p. 615 and next abstracts]. Positive results were obtained in a considerable proportion of the inoculation tests on *Ulmus foliacea* from France, Spain, Rumania, and Greece, and on *U. glabra* and its var. *fastigiata* from England and Baarn (Holland), respectively. The resistant selection No. 24 of *U. foliacea* was again tested with very satisfactory results, while Nos. 28, 31, 42, and 44, and *U. glabra* No. 49 also showed promise of utility for grafting purposes. In inoculation tests on *U. americana*, *C. ulmi* was found to grow more rapidly above than below the site of infection. In *U. glabra* the development of the fungus was observed to proceed more quickly during the hot weather in early July than at the end of May.

WALTER (J. M.). **Variation in mass isolates and monoconidium progenies of Ceratostomella ulmi.**—*J. agric. Res.*, liv, 7, pp. 509–523, 6 figs., 1937.

A detailed and illustrated account is given of cultural studies of mass

and monoconidial isolates of *Ceratostomella ulmi*, on lines similar to those followed by Swingle [*R.A.M.*, xvi, p. 142]. The results of the two works lead the author to the conclusion that *C. ulmi* comprises a wide range of cultural races [ibid., xvi, p. 504], some of which are highly variable, though the presence within the species of relatively stable lines is not precluded; he is further inclined to the opinion that sector variants, which appeared in isolates from diseased elm trees and in monoconidial progenies from these isolates, are true mutants. It is believed that conclusive evidence has been obtained that the strikingly different cultural races of *C. ulmi* arise fortuitously and that they are being produced in nature, a fact of considerable importance to those concerned in the cultural diagnosis of cases of Dutch elm disease.

Beattie (R. K.). **The Dutch Elm disease in Europe.**—*Amer. Forests*, xliii, 4, pp. 159–161, 201, 6 figs., 1937.

Elms attacked by *Ceratostomella ulmi* [see preceding abstract] are stated to have been first observed almost simultaneously in 1919 in Holland (Tilburg and Hoeven, near Oudenbosch), France (between Châlons-sur-Marne and Ste. Menehould), and Belgium, where the disease, however, probably dates back as early as 1913, judging by counts of infected annual rings in a log recently cut between Rochefort and Dinant. Dying elms are common along the railway from Calais to Paris, and for miles along the roads east of the city the old trees have almost disappeared. The disease was detected in the summer of 1936 near Vichy, whence some burl elm logs have been imported into the United States; other countries exporting these burls or galls (commercially known as 'Carpathian elms' but thought to be possibly due to crown gall [*Bacterium tumefaciens*: *R.A.M.*, x, p. 765]) are England, Czecho-Slovakia, and Germany. *C. ulmi* has been reported to cause heavy damage in Italy [ibid., xvi, p. 353], 90 per cent. of the trees in one locality of Emilia being reported dead, 52 to 78 per cent. in five others, and 33 to 45 per cent. in nine more of the same province. In 1936 *C. ulmi* was isolated from brown streaks in the 1923 annual ring of elms near Newmarket, although the occurrence of the disease in England was first recorded at Totteridge, near London, in 1927. Infection has spread northward to Felton (Northumberland), within 30 miles of the Scottish border, to the east coast, and to the Lake District. Recovery from the disease does not confer immunity, nor does it prevent the infected individual from acting as a reservoir of contamination.

Rankin (W. H.). **Summary of the Dutch Elm disease eradication project.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1936*, pp. 14–21, [1937].

In reviewing the results obtained up to August, 1936, in the Dutch elm disease [*Ceratostomella ulmi*: see preceding abstract] eradication campaign in New York, the author states that no diseased elms have been found farther than 50 miles from New York City in any direction. On 22nd August, 1936, there were 1,496 diseased elms in New York State, as compared with 2,258 and 2,503 in 1935 and 1933–4, respectively. In the entire infected area east of the Hudson river the corresponding figures for 1933–4, 1935, and 1936 (up to 31st August) were 2,361, 1,680, and 1,101, while in the city itself the corresponding figures

were 1,257, 690, and 249. In Manhattan, Queens, and Brooklyn only 10 diseased elms were found in 1936 (up to 31st August), as against 138 in 1934.

The results obtained in New York City have conclusively shown that the eradication campaign has reduced the number of infections to a point where local (as against Federal) control has become practicable. It is expected that the annual loss of elms in the city will be reduced to under 100 next year or the year after, and that the scattered infections found 30 to 50 miles distant from the city will be erased annually. The author concludes that the disease can be confined to the present limited zone and that the large area to the north and east of New York can thus be protected.

McKenzie (M. A.) & Becker (W. B.). **The Dutch Elm disease. A new threat to the Elm.**—*Bull. Mass. agric. Exp. Sta.* 343, 16 pp., 8 figs., 1937.

A concise account is given in popular terms of the symptoms and manner of spread of Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstract], to assist in the immediate recognition of the disorder should it make its appearance in Massachusetts. It has already been found within fifty miles of the State boundaries to the south and west.

Creager (D. B.). **Cephalosporium wilt of Elms.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1936,* pp. 140–144, [1937].

The causal organism of the *Cephalosporium* wilt of elms in North America [*R.A.M.*, xvi, p. 504] is stated to have been named and definitely described by May and Verrall as *Dothiorella ulmi* [In *Mycologia*: see *R.A.M.*, Nov. no.]. Two types of reproductive bodies are produced, naked spore heads and pycnidia, the latter appearing singly or in stromatic groups.

Entrance into the host takes place through leaf wounds caused by insects, the fungus finally becoming established in the vessels of the young twig, and overwintering in the twig tips as vegetative mycelium and pycnidia. Pycnidia in the bark of dead branches or on the ground produce viable spores the following spring.

Preliminary tests on control indicated that all infected trees should be excluded from plantings and nurseries, the introduction of diseased stock being the chief cause of epidemics. Carefully pruning out affected branches twice or more during the year is sometimes effective. Badly diseased trees should be eradicated and burned, and all others kept as free as possible from insect injury, especially those that are already infected or in proximity to infected trees. Applications of a combined insecticidal-fungicidal spray may reduce the number of leaf infections.

Faull (J. H.). **Pathological studies on Beech at the Arnold Arboretum.** —*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1936,* pp. 21–29, [1937].

After giving a brief, popular account of the beech bark disease associated with *Cryptococcus fagi* and a variety of *Nectria coccinea* [*R.A.M.*, xv, p. 542], the author states that one crop of the spores of *Fomes fomentarius* [ibid., xvi, p. 633] is discharged during a two- to four-week period between the latter part of April and the end of May. Infection

is set up in wounds, through stubs or dead branches, entry generally taking place in the crown.

ROMBOUTS (J.). **Uma molestia de 'Eucalyptus' e de 'Populus', na Bahia, causada por 'Corticium salmonicolor' B. et Bred.** [A disease of *Eucalyptus* and *Populus* in Bahia, caused by *Corticium salmonicolor* B. & Bred.]—*Rodriguésia*, ii, 7, pp. 301–305, 2 figs., 1936. [Received June, 1937.]

Corticium salmonicolor is stated to have been found for the first time in 1935–6 attacking *Eucalyptus* and *Populus nigra* trees in moist and shady places at the Experimental Station of Agua Preta, Bahia. On *Eucalyptus* it caused a rapid wilting of the leaves which remained attached to the twigs for long periods of time after death. The attacked twigs died back, and the fungus eventually reached the main stem, on which canker-like wounds were formed, edged by callus tissue; very occasionally the wounds extended to the trunk, sometimes resulting in the death of the tree. On the poplar the fungus chiefly attacked the young shoots and twigs high up the tree, the first symptom being the sudden death of the leaves; the bark of the main stems was rarely found to be infected, and no cankers were seen. The *Necator decretus* stage of the fungus was observed on *Eucalyptus* but not on the poplar.

MOUNCE (IRENE) & MACRAE (RUTH). **The behavior of paired monosporous mycelia of Fomes roseus (Alb. & Schw.) Cooke and Fomes subroseus (Weir) Overh.**—*Canad. J. Res.*, xv, 4, pp. 154–161, 1 pl., 12 figs., 1937.

The results of cultural experiments briefly described in this paper confirmed the view that *Fomes subroseus* [*R.A.M.*, xiv, p. 795] is specifically distinct from *F. roseus*, with which it had been confused for many years, inasmuch as monosporous mycelia of the two fungi did not form clamp-connexions when paired with one another in all possible combinations. The two species may also be differentiated by the characters of their spores, which are elongate ellipsoid in *F. roseus* and narrow cylindric and slightly curved in *F. subroseus*. It was further established that the two organisms are heterothallic and bipolar, and with one exception, complete interfertility was shown to exist between haploid mycelia of either one of them, independently of their source of collection. The exception is of particular interest, in that it shows that the two cultures of *F. roseus* from widely separated sources, which in the first pairing experiments failed to produce clamp-connexions, possess one interfertility factor in common.

KANZOW (H.). **Die Douglasie. Aufstellung einer Ertragstafel auf Grund der Ergebnisse der preussischen Probeflächen und Auswertung von Provenienzversuchen.** [The Douglas Fir. Compilation of a yield table on the basis of the data from the Prussian test areas and the evaluation of investigations in the place of origin.]—*Z. Forst- u. Jagdw.*, lxix, 2, pp. 65–93; 3, pp. 113–139; 5, pp. 241–271, 4 figs., 18 graphs, 2 maps, 1937.

On the basis of this exhaustive, fully documented survey of the timber output of certain Douglas fir [*Pseudotsuga taxifolia*] stands set

aside for experimental purposes in Prussia, the writer draws some conclusions bearing on the relation of the place of origin of the seed on the development of disease in the trees, with special reference to *Rhabdocline pseudotsugae* [*R.A.M.*, xvi, p. 507], the incidence of which is shown to have steadily increased from 1932 to 1935. In general, the disease is of economic importance only in stands from seed originating at altitudes of 1,500 m. and above, the resistance of the coastal forms amounting for practical purposes to immunity. In future, therefore, Douglas fir supplies from the United States should consist exclusively of the maritime forms, those of the continental regions being further undesirable on account of their slow growth and susceptibility to the honey fungus [*Armillaria mellea*: ibid., xi, p. 141]. Abrupt changes of climate are very liable to induce pathological manifestations in *P. taxifolia*. Thus, Schotte found (*Medd. Skogsforsöksanst. Stockh.*, p. 305, 1923) that in Sweden *Phacidium infestans* [*R.A.M.*, xiv, p. 266] occurs with great severity on conifers of southern origin transplanted to northern areas.

WILSON (M.). **The Phomopsis diseases of conifers.**—*Scot. For. J.*, li, 1, pp. 39–45, 1937.

A review is given of some recent outstanding contributions to the knowledge of *Phomopsis* diseases of conifers, notices of most of which have appeared from time to time [*R.A.M.*, xiv, p. 541 *et passim*].

WILSON (M.). **The occurrence of Keithia tsugae in Scotland.**—*Scot. For. J.*, li, 1, pp. 46–47, 1937.

Keithia tsugae was observed in January, 1937, attacking the leaves of *Tsuga canadensis* [*R.A.M.*, xv, p. 331] in the Tweed valley and causing a brown discoloration, necrosis, and defoliation. So far only one tree has been found infected and the evidence points to a recent introduction of the fungus, an active parasite, from the United States. Seen from a distance, the tree presents a patchy, brown aspect due to the development of groups of diseased twigs. The mature fructifications, consisting of a layer of asci with four bicellular, brownish ascospores, and paraphyses, are cushion-like, circular, dark brown, about $\frac{1}{4}$ in. in diameter, and occur in clusters of up to 18 or so on the under side of the leaf.

FAULL (J. H.). **Chrysomyxa empetri—a Spruce-infecting rust.**—*J. Arnold Arbor.*, xviii, 2, pp. 141–148, 2 pl., 1 diag., 1937.

Full details are given of the writer's successful cross-inoculation experiments with *Chrysomyxa empetri* (hitherto known only on *Empetrum*) from *E. nigrum* in Quebec on *Picea glauca* and *P. rubens* and reciprocally from *P. glauca*, on which it was observed in the *Peridermium* stage at Metis Beach, Quebec, in 1933. The reddish-brown, aparaphysate, subepidermal spermogonia of the rust, formed on the current season's needles, measure 135 to 162 μ in breadth and 108 to 135 μ in depth and extrude subglobular to ellipsoid spermatia, 5·5 to 10 by 5 to 7 μ, in a colourless, sticky liquid. The maximum height and width of the yellow, elliptical to subcircular aecidia (peridermia), also on the current season's needles, are 0·5 to 2 and 0·5 to 1·5 mm., respectively; the polygonal cells of the colourless peridium measure 32 to 76

by 19 to 54 μ, and the yellow, ellipsoid or ovoid, rarely subspherical, verrucose aecidiospores 42 by 27 μ. The catenulate, orange, pulverulent, ellipsoid, ovoid, or subglobose uredospores measure 27 to 48 by 21 to 27 μ (average 35 by 25 μ). The yellow, cushion-shaped, subcircular to elongated teleutosori, occurring on over-wintered leaves of *E. nigrum* and other species (of which *E. atropurpureum* and *E. eamesii* are new records for Quebec and Newfoundland, respectively), produce yellow, catenulate spores, 19 to 24 by 18 to 21 μ. The pale yellow, slightly curved to strongly arched basidia measure up to 65 by 7 to 8 μ and the very thin-walled, subglobose to slightly ellipsoid basidiospores 10 to 15 (usually 12) μ in diameter.

GILGUT (C. J.). **Cytospora canker of Spruces.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf.*, *1936*, pp. 113–119, [1937].

The die-back of the lower limbs of blue spruce [*Picea pungens* var. *glauca*] and Koster's spruce (*P. pungens* [var.] *kosteri*), associated in North America with a *Cytospora* [*R.A.M.*, xii, p. 408] since identified by L. E. Wehmeyer as *C. kunzei*, starts on the limbs nearest the ground, and spreads upwards and laterally. It is commonest on trees over 15 years old, and occurs both on small branches and large limbs, trunk infection being observed in Canada. The visible effect is most striking in winter, when the brown, dead leaves on the limbs girdled in summer appear in strong contrast to the silvery-green leaves on the healthy limbs. Below the recently killed limbs those dead for over one season are leafless. Cankers are generally found on branches and limbs $\frac{3}{4}$ in. in diameter or more. The cankered area is usually near the trunk, but may be on any portion of the main limb or a side branch; infection generally starts on the under side of a limb, and is usually accompanied by gum exudation. There is no external evidence of canker other than the death of the limb or the presence of gum.

Inoculations on healthy, wounded limbs of Norway spruce [*P. excelsa*] with a spore suspension or mycelium gave positive results while unwounded similarly inoculated limbs and controls remained healthy. It is concluded that *C. kunzei* is a virulent wound parasite.

KOLLMANN (F.). **Technologie des Holzes.** [The technology of wood.]—xviii+764 pp., 170 figs., 159 diags., 275 graphs, Berlin, J. Springer, 1936. RM. 69. [Received June, 1937.]

This exhaustive, fully documented treatise on the technology of wood contains sections on bacterial and fungal decay and their prevention by chemical impregnation and other methods, reference to which has been made from time to time in this *Review*.

HENDRICKX (F. L.). **Les champignons pigmentogènes du bois.** [Wood-staining fungi.]—*Ann. Gembl.*, xliii, 4, pp. 97–113, 1937.

Short notes are given on a large number of staining fungi belonging to the Ophiostomataceae, Aspergillaceae, Lasiosphaeriaceae, Helotiaceae, Sphaeropsideae, Dematiaceae, Stilbaceae, Tuberculariaceae, and other Fungi Imperfecti, followed by sections on their ecology (i.e., requirements in point of nutrition, aeration, temperature, and humidity),

the effects of the staining on the properties of the wood and pulp, and control [*R.A.M.*, xvi, p. 579]. A bibliography of 60 titles is appended.

ROBAK (C. A.). **Way discovered to protect wooden poles with arsenic trioxide.**—*Industr. Engng Chem.*, News Ed., xv, 8, p. 171, 1937.

A Swedish patent recently taken out by the Boliden mining company describes a simple method of applying arsenic trioxide or preparations based on this compound to wooden telegraph poles, fence posts, and the like. The substance is moulded into cylinders of appropriate size, which are inserted into axial holes bored into the ends of the poles, those in the lower ends being closed by a wooden plug and those in the upper ends by a piece of galvanized iron plate with a central hole of 1 to 2 mm. in diameter. Transportation of the arsenic compound from the cylinders into the surrounding wood is effected by rain water or water absorbed from the soil.

RIGG (T.), ASKEW (H. O.), & CHITTENDEN (E.). **Brown-heart of Swedes and Turnips in Nelson district: a boron deficiency ailment.**—*N.Z.J. Sci. Tech.*, xviii, 10, pp. 750–755, 2 figs., 1937.

A survey of the swede and turnip crops in the Nelson district of New Zealand revealed a wide prevalence of brown heart [*R.A.M.*, xvi, p. 360], the incidence of which in certain cases amounted to 100 per cent. On a local soil associated with a serious boron deficiency disease of apples [ibid., xvi, p. 388], the application of 56 lb. borax per acre as a top-dressing to young Imperial Green Globe turnips largely controlled brown heart. Chemical analyses of healthy swede and turnip crops showed them to contain up to 18·8 p.p. m. boron in the dry matter compared with a minimum of 4·7 p.p. m. for the diseased plants.

ROLAND (G.) & DECOUX (L.). **Recherches sur les carences de magnesium et de phosphore chez la Betterave sucrière.** [Studies on magnesium and phosphorus deficiencies in the Sugar Beet.]—*Publ. Inst. belge Amélior Better.*, v, 2, pp. 43–72, 7 figs., 1937. [Flemish, German, and English summaries.]

Sugar beets grown in nutrient solutions or on sand deprived of magnesium develop interveinal chlorosis of the outer and middle leaves, the affected tissues of which rapidly become covered with fungi, especially *Alternaria* sp. [*R.A.M.*, xv, p. 765]. The sugar content of the diseased foliage was found to be higher than that of healthy leaves. The affected seedlings die in about two months. Soil samples from Belgian fields in which the beets showed symptoms resembling the foregoing in 1936 were found to be poor in magnesium, and the analysis of material from plots forming part of a potash-manuring experiment showed that the application of heavy potash dressings tends to deplete the available magnesium.

Beets grown in nutrient solutions without phosphorus may live for a considerable time but remain stunted. The foliage is dark green, the outer leaves developing a blackish-brown necrosis starting at the tip of the lamina and progressing downwards, without any preceding chlorotic symptoms.

[An account of this work is also given by G. Roland in *C.R. Congr. int.*

Indus. agric., 1937, pp. 457–467, 1937, and in *Tijdschr. PlZiekt.*, xlii, 8, pp. 171–188, 1937.]

BENNETT (C. W.). **Correlation between movement of the curly top virus and translocation of food in Tobacco and Sugar Beet.**—*J. agric. Res.*, liv, 7, pp. 479–502, 5 figs., 1 graph, 1937.

Continuing his studies on the curly top virus in sugar beet and tobacco [*R.A.M.*, xvi, p. 226], the author gives a detailed account of experiments, the results of which showed that beet seedlings were probably almost entirely invaded by the virus in two to four days, whereas in larger plants the virus in some cases took over four weeks to pass from a mature inoculated leaf to a similar uninoculated leaf on the opposite side. In Turkish tobacco the virus was found to move more rapidly in the direction of the root system than in the reverse direction. In *Nicotiana glauca* plants 3 ft. high, the virus moved downwards from infected Turkish tobacco grafts at the top to healthy grafts at the base in average periods of 28 and 32 days, but in plants on which the position of the infected and healthy grafts was reversed, the virus required averages of 130 and 302 days to reach the top and produce symptoms in the healthy grafts. In some of these plants the tops were not reached by the virus in over a year, but when they were defoliated at the top the apical grafts developed symptoms in an average period of 18 days from defoliation. When one shoot of a beet plant with three shoots was inoculated with curly top, and a second was defoliated or placed in the dark for five days without inoculation, the third shoot serving as control, curly top symptoms developed in the defoliated or darkened shoot in average periods of 10·6 to 17·6 days, i.e., from 0·1 to 5·6 days later than in the inoculated shoot, while the control shoot remained free from symptoms for periods of 55 to 183 days on the average; other tests in which leaf hoppers (*Eutettix tenellus*) were used to detect the virus indicated that the virus moved from inoculated shoots showing symptoms into uninoculated shoots that were both darkened and defoliated in 24 to 48 hours. It was further shown that the virus moved out of inoculated green beet leaves in the light in four hours, but failed in most instances to move out of etiolated leaves, inoculated at their distal end, and kept in the dark in periods as long as 21 days; the virus, however, moved out of the inoculated etiolated leaves in 24 to 72 hours when the leaves were returned to light five days after inoculation.

These results are considered to indicate that the movement of the virus in the hosts bears little or no relation to virus multiplication or to virus concentration gradients, but is dependent on physiological processes inside the normal plant. Apparently in both beet and tobacco invasion of some parts may be prevented by providing conditions favouring the synthesis of excess carbohydrates, and, on the other hand, may be induced by providing for food deficit in these parts, strongly suggesting a correlation between virus movement and food translocation.

JOHNSON (F.) & JONES (L. K.). **Two mosaic diseases of Peas in Washington.**—*J. agric. Res.*, liv, 8, pp. 629–638, 5 figs., 1937.

The results of the authors' investigations during the last two years

of mosaic of peas in western Washington [*R.A.M.*, xv, p. 345] showed the existence there of two distinct virus diseases of the crop, namely, enation mosaic [ibid., xvi, p. 583], which is apparently similar to the one referred to as common pea mosaic by Zaumeyer and Wade [ibid., xvi, p. 83], but differing from it in that it systemically infects Corbett Refugee beans; and 'severe' mosaic, apparently similar to Zaumeyer and Wade's white sweet clover mosaic [loc. cit.]. These two virus diseases often develop destructively in Washington, especially on market-garden and canning peas in the western part of the State. A tabulated account is given of special tests, the results of which again showed that the two viruses are very seldom carried by the seed, and that severe mosaic has a wide range of hosts among leguminous plants, while that of enation mosaic is much more limited. It was further found that the enation virus was inactivated in less than three hours *in vitro* and in less than four days in dry plant tissue; it does not resist dilution, possibly because of its very rapid inactivation in extracted plant juice, and no infection could be obtained with enation virus exposed to temperatures from 40° to 50° C. The severe mosaic virus, on the other hand, remained active *in vitro* for at least 15 days, and in dry plant tissue for 338 days; it still retained a low percentage of infectivity at 1 in 100,000 dilution, but was not infective at 1 in 1,000,000 dilution, and was inactivated at temperatures between 60° and 70° C.

BERGER (G.). **Un grave maladie de la Fève au Maroc (Botrytis fabae Sard.).** [A serious disease of Broad Bean in Morocco (*Botrytis fabae* Sard.).]—*Rev. Path. vég.*, xxiv, 2, pp. 101–111, 4 figs., 1937.

Broad beans [*Vicia faba*] in Morocco have for some years been seriously attacked by *Botrytis fabae* [*R.A.M.*, xvi, p. 230]. Though difficult to distinguish morphologically from *B. cinerea*, *B. fabae* is distinctly different from *B. cinerea* in its biological characters and specificity to *V. faba*, inoculations of this host with conidia of *B. fabae* and of the strains of *B. cinerea* from geranium and banana giving positive results only in the case of the first-named organism. The disease was reported from Chaouia, Doukkala, Tadla, and the northern districts of Morocco. It is at present one of the most virulent parasites of broad beans locally, especially under damp conditions. All dead, infected leaves should be burnt, at or before the completion of harvesting, rotation should be practised, due allowance being made for the fact that the spores are wind-borne, and, finally, spraying with a strongly adhesive copper mixture might be tried as a preventive measure.

MCKAY (R.). **Germination of oospores of Onion mildew, Peronospora schleideniana W. G. Sm.**—*Nature, Lond.*, cxxxix, 3522, pp. 758–759, 1 fig., 1937.

The addition of 0·01 to 0·02 per cent. potassium permanganate to water containing 5- to 6-year-old oospores of onion downy mildew (*Peronospora schleideniana*) [*R.A.M.*, xvi, p. 627], weathered out-of-doors, resulted in 60 to 85 per cent. germination within 48 hours at 15° to 20° C., compared with 0·05 to 1 per cent. in the controls. The reagent did not appear to act directly on the oospores, the presence of plenty of organic remains being essential for germination, which

ordinarily takes place by means of a main hypha with three to nine short branches arising at irregular intervals from it.

Evans (R. I.). **Cytological studies on the parasitic relationship of Urocystis cepulae to Allium fistulosum.**—*Amer. J. Bot.*, xxiv, 4, pp. 214–218, 17 figs., 1937.

In this study on the nature of the host-parasite relations between *Urocystis cepulae* [*R.A.M.*, xii, pp. 416, 610] and *Allium fistulosum*, it was found that seedlings that ultimately produce smut-free plants are consistently and successfully parasitized by the fungus in the upper parts of the cotyledons, where chlamydospores are freely produced, though the lower half at least remains unaffected. The prevalence and severity of infection was little affected by a range of soil temperatures extending from 10° to —26° C. Healthy mycelium was able to develop in the upper part of a cotyledon with profuse chlamydospore formation.

When penetration of the lower part of the cotyledon occurs the invading hypha with its branches may be completely inhibited almost immediately, or some of the branches may be inhibited, this being quickly followed by the disorganization of those branches which had penetrated rather more deeply into the host tissue, or, again, the fungus may penetrate the deeper tissues where, however, the environment becomes unsuitable for its further growth.

This defence mechanism is apparently comparable with that of *A. cepa* seedlings when passing from susceptibility to resistance.

Schuphan (W.). **Untersuchungen über wichtige Qualitätsfehler des Knollenselleries bei gleichzeitiger Berücksichtigung der Veränderung wertgebender Stoffgruppen durch die Düngung.** [Studies on important defects of quality in Celeriac, together with a consideration of the change induced by manuring in groups of desirable substances.]—*Bodenk. u. PflErnähr.*, N.F., ii, 5–6, pp. 255–304, 3 col. pl., 7 figs., 2 graphs, 1937.

In the course of this exhaustive investigation of certain defects involving a serious depreciation in the market value of German celeriac, the writer discusses a discoloration of the sliced rootstocks known as 'iron- or rust-spot', which was formerly attributed to iron oxidation but has now been traced, by intensive anatomical and microchemical analyses on the Delikatess variety, to the accumulation in special 'excretion vessels' of resinous substances and ethereal oils.

Blackening of the rootstocks on cooking has been found to result from a disturbance of the metabolic and physiological equilibrium through the simultaneous lack of calcium and nitrogen in the soil.

Hollowness, due to the rupture of cells in the pith, appears to be primarily a varietal peculiarity, e.g., of Saxa and less conspicuously of Delikatess.

Wasewitz (H.). **Die Salatfäule und ihre Bekämpfung.** [Lettuce rot and its control.]—*Kranke Pflanze*, xiv, 4, pp. 71–73, 1937.

The following methods have given good control of lettuce rot (*Sclerotinia minor*) at the plant protection headquarters, Giessen (Germany) [*R.A.M.*, xv, p. 420]. The seed-beds may be treated, 10 to 14

days before the planting-out of the crop, with 10 l. per sq. m. of a 2 to 3 per cent. formaldehyde solution, 0·25 per cent. uspulun, or brassikol, the last-named a stimulatory dust to be strewn over the surface at the rate of 40 to 50 gm. per sq. m. Sterilization may also be effected by steaming either by means of grids fitted with a vapour-generating apparatus operating at a temperature of 100° to 110° C. for not less than 20 minutes, sunk into the soil to a depth of 40 to 50 cm., or by heating the soil in a hermetically sealed container of ½ cu. m. capacity at 100° for 20 minutes. The former method is more suitable for large-scale use and the latter for small gardens. The cost of steaming to a depth of 50 cm. may be reckoned at approximately Pf. 55 to 60 per sq. m. and that of chemical treatment at Pf. 15 to 55.

RÖDER (K.). **Perithecien von Erysiphe cichoracearum DC. em. Salm. an Freilandgurken (Cucumis sativus L.).** [Perithecia of *Erysiphe cichoracearum* DC. em. Salm. on outdoor Cucumbers (*Cucumis sativus* L.).]—*Angew. Bot.*, xix, 2, pp. 161–163, 1 fig., 1937.

Attention is drawn to the occurrence in 1935 on outdoor cucumbers near Berlin of the perithecial stage of *Erysiphe cichoracearum* [*R.A.M.*, xvi, p. 365], the detection of which is stated to be the sole reliable means of differentiating this mildew from the similar disease caused by *Sphaerotheca* [*humuli* var.] *fuliginea* [loc. cit.].

PANSE (E.). **Die Kräuselkrankheit (Rosette, Mosaik) bei Erdnüssen.** [Curl disease (rosette, mosaic) of Groundnuts.]—*Tropenpflanzer*, xl, 5, pp. 218–220, 1937.

According to an article in *Bull. mens. Ag. econ. A.O.F.*, 190, 1936, groundnut rosette is widespread in Senegal, having first been observed at Bambey in 1924, again in 1929, occurring in epidemic form in 1930, sporadically in 1931, and entirely disappearing until 1935, when the yield from late planted fields (first half of July) was nil in the Bas-Saloum region (near British Gambia) [*R.A.M.*, xii, p. 5]. A circular of the Acting Governor of French West Africa states that the losses from rosette amount to 75 to 80 per cent. and prohibits the use for propagation of incompletely ripened nuts from infected areas; spraying with an emulsion of 425 gm. soap, 1 l. petroleum, and 50 l. water is recommended.

BROEKHUIZEN (S.). **Mycologische vondsten op Champignonbedden.** [Mycological finds on Mushroom beds.]—*Fungus, Wageningen*, viii, 4, pp. 46–49, 2 figs., 1937.

Semi-popular notes are given on the following fungi detected in mushroom [*Psalliota* spp.] beds in Holland: *Coprinus* spp. [*R.A.M.*, xiv, p. 345; xv, p. 628], including *C. congregatus*, *C. ephemerus*, and *C. fimetarius*, *Mycogone perniciosa* [ibid., xvi, p. 15], *Myriococcum praecox* [ibid., xiv, p. 345] (the reputed connexion between which and *Papulaspora byssina* [loc. cit.] could not be traced by the writer), *Oospora fimicola* [ibid., xiv, p. 345], *Panaeolus fimicola* and *P. papilionaceus*, *Penicillium* spp., *Peziza vesiculosa*, *Pleurotus mutilus* [ibid., xvi, p. 16], *Trichoderma koningi* [cf. loc. cit.; xvi, p. 558], and *Volvaria gloiocephala*.

MÜLLER (K.). **Ein Vierteljahrhundert Bekämpfung der Reben-Peronospora (Plasmopara viticola).** [A quarter of a century's control of the Vine *Peronospora* (*Plasmopara viticola*).]—*Angew. Bot.*, xix, 2, pp. 110–118, 1937.

The writer briefly outlines the development of his 'incubation calendar' method of forecasting attacks of vine downy mildew (*Plasmopara viticola*) to facilitate the prompt application of control measures, and compares it with the analogous systems employed for the same purpose in France [*R.A.M.*, xvi, p. 513]. French criticisms of the incubation calendar are discussed and considered to rest on a misinterpretation of the principles involved, and on failure to recognize certain fundamental differences between laboratory experiments and practical field work, for which due allowance must be made. Such inevitable minor discrepancies do not invalidate the general well-attested reliability of the system.

ROUS (L.). **Essais contre le court-noué.** [Experiments on the control of court-noué.]—*Progr. agric. vitic.*, cvii, 12, pp. 285–287, 1937.

In this account of unsuccessful attempts that were made by the author to control court-noué [*R.A.M.*, xvi, p. 436] in a severely diseased vineyard of his, it is stated that a plot of White Ugni vine grafted on the French 333 hybrid on court-noué diseased soil remained free from the disease three years after planting, possibly indicating the immunity of this vine from court-noué.

GALLÈS (P.). **L'Ugni blanc et le court-noué.** [White Ugni and court-noué.]—*Progr. agric. vitic.*, cvii, 15, pp. 346–347, 1937.

A few observations are reported, supporting Rous's record of the marked resistance of the White Ugni vine (also known in some localities under the name St. Emilion) to court-noué [see preceding abstract], either on its own roots or grafted on various French hybrids. The author briefly describes the good points of this variety for wine production, which, if its resistance to the disease is further proved, should ensure for it a very wide extension in regions where court-noué is prevalent.

VIVET (E.). **La maladie du Cot de Chéragas.** [The 'Cot de Chéragas' disease.]—*Progr. agric. vitic.*, cvii, 15, pp. 348–349, 1937.

The author reproduces the description given by him in 1923 of a die-back of vine twigs, most frequent on the 'Cot de Chéragas' variety, which is stated to be prevalent in certain regions of Algeria. The disease usually occurs during prolonged rainy spells at the end of April or beginning of May, in the form of a black discoloration of an apical node; the discoloration works downwards, entailing a soft rot of the internodes, but does not reach the base of the shoot, stopping just before reaching a node, from which new growth is produced. The rotted portions of the shoots drop off, and the affected stocks most commonly recover on the onset of dry weather. The disease has also been observed on the Aramon and Mourvèdre varieties. The causal organism is stated to be a species of *Sclerotinia* which, like *S. libertiana* [*S. sclerotiorum*: *R.A.M.*, xiii, p. 746] forms a thick white mycelial felt and black sclerotia.

Jenkins (A[nna] E.). **Comparações culturaes e inoculações em Videira com os fungus 'Elsinoe fawcetti', 'E. ampelina', e 'E. veneta'.** [Comparative cultural studies and inoculations into the Vine of the fungi '*Elsinoe fawcetti*', '*E. ampelina*', and '*E. veneta*'.]—*Arch. Inst. biol. Def. agric. anim., S. Paulo*, vii, pp. 23–32, 3 pl. [1 col.], 9 figs., 1936. [English summary. Received June, 1937.]

The author states that in 1925, when she first studied the taxonomic status of *Sphaceloma fawcettii* (*Elsinoe fawcetti*) [*R.A.M.*, iv, p. 476, and above, p. 603], comparative cultural studies of this fungus and of *S. ampelinum* and *Plectodiscella veneta*, now classified as *E. ampelina* [ibid., xv, p. 427] and *E. veneta* [ibid., xv, p. 467], respectively, showed that the last-named differed in its pulvinate type of growth from the convolute type exhibited by the other two, which also differed from one another in certain other details. The development of the conidial fructification, which is described in some detail for *E. fawcetti*, is very similar in the three organisms. Artificial inoculation experiments in 1927, [some details of which are indicated], showed that *E. ampelina* alone was pathogenic to the vine.

Branas (J.) & Bernon (G.). **Résumé des recherches entreprises en 1936 sur le traitement de la panachure de la Vigne.** [A résumé of the researches undertaken in 1936 on the control of Vine variegation.] —*Ann. Éc. Agric. Montpellier*, N.S., xxiv, 3, pp. 249–252, 1937.

The partial yellowing of vine leaves known as 'panachure' or variegation [*R.A.M.*, xvi, p. 18] is stated to be transmissible from the stock to the graft in a few months. Under natural conditions the disease may disappear for no apparent reason. The author considers that the improvement in the condition brought about by spraying the foliage with lamp black [loc. cit.] is probably mainly due to the deposit screening the leaves from the sun.

Brundza (K.). **Report of the Phytopathological Section of the Plant Protection Station in Lithuania for the year 1935.**—32 pp., 5 figs., Kaunas, 1937. [Lithuanian, with English summary.]

The following are among the items of interest in this report on Lithuanian plant diseases in 1935. Four fungi were observed on different organs of their hosts from those habitually attacked, viz., *Septoria lycopersici* on tomato fruits [*R.A.M.*, xv, p. 62], *Ascochyta boltshauseri* on kidney bean (*Phaseolus vulgaris*) pods [ibid., xiv, p. 613], and *Cladosporium cucumerinum* and *Colletotrichum lagenarium* on cucumber leaves and fruits, respectively [ibid., xv, pp. 197, 698]. Diseases newly recorded included *Pseudomonas vesicatoria* [*Bacterium vesicatorium*] on tomatoes [ibid., xvi, p. 493], *Phyllosticta phaseolina* on beans [ibid., xv, p. 776], *Bacillus tracheiphilus* [*Erwinia tracheiphila*] on cucumbers [ibid., xv, p. 197], *Pseudomonas* [*Bact.*] *phaseoli* var. *sojense* on soy-bean [ibid., xiii, pp. 210, 564], *Pestalozzia lupini* [*Ceratophorum setosum*: ibid., xvi, p. 636] on lupin, *Entyloma fuscum* on poppies (*Papaver*) [ibid., xvi, p. 493], *Phomopsis mali* [ibid., xvi, p. 299] on the apple, *Phoma solanicola* on potato stems [ibid., x, p. 293], and *Colletotrichum atramentarium* [ibid., xv, pp. 445, 690; xvi, p. 402] on eggplant fruits.

Zoospore and conidial suspensions of *Phytophthora infestans* were

found to retain their infective capacity towards potatoes after 24 hours' exposure to a temperature of $-6°$ C. and to fluctuating outdoor temperatures (minimum $-12°$) from 4th to 18th March. The fungus caused heavy damage (up to 100 per cent.) on tomato fruits [ibid., xv, p. 62] in the damp autumn of 1935, but did not attack the foliage.

Bean seeds infected by *C. lindemuthianum* [ibid., xiv, pp. 670, 734] and *A. boltshauseri* yielded poor, infected crops; good control was secured by 30 minutes' immersion in 0·25 per cent. uspulun or 10 per cent. denatured alcohol.

MITRA (M.). **India: new plant diseases recorded in 1936.**—*Int. Bull. Pl. Prot.*, xi, 5, pp. 85–87, 1937.

Among these records for 1936, a number of which have been noticed from other sources, may be cited *Fusarium moniliforme* [*Gibberella moniliformis*] reported from Calcutta as causing storage rot of citrus, and *Bacillus* [*Bacterium*] *solanacearum* [*R.A.M.*, x, p. 224] on tobacco in the Punjab.

Report of the Agricultural Department, Dominica, 1936.—Trinidad, Imper. Coll. Trop. Agric., 32 pp., 1937.

The following items of phytopathological interest occur on pp. 10–11 of this report. In view of the general incidence of Panama disease (*Fusarium* [*oxysporum*] *cubense*) of bananas throughout Dominica various recommendations for control made by C. W. Wardlaw after a visit in May were carried out in their entirety. These [which are detailed in an appendix, p. 27] included a survey of the heavily infected areas, the enforcement of quarantine measures to prohibit the removal of infected material, routine inspections and treatment, the destruction of diseased stools, and improved cultural methods. Gros Michel bananas were attacked by *Bacterium solanacearum* in several localities [*R.A.M.*, xiii, p. 684].

THOMPSON (A.). **Division of Mycology. Annual Report for 1936.**—*Bull. Dep. Agric. S.S. & F.M.S.*, 26, Gen. Ser., pp. 49–57, 1937.

In this report [cf. *R.A.M.*, xv, p. 632] it is stated that *Fomes noxius* [ibid., xvi, p. 635] is dangerous to oil palms only when the trees are unable from other causes to make vigorous growth. In one block of backward trees, whenever the early presence of the fungus in the outer stem tissue or adjacent leaf-base tissue was observed, advanced root rot eventually developed. The leaf bases of trees where decay did not spread to the stem later showed the presence of *F. lamaensis* [ibid., xv, p. 632], and on two trees where the stem was slightly penetrated at first they bore *F. lamaensis* var. *secedens* which appears to be morphologically and parasitically intermediate between *F. lamaensis* and *F. noxius*. In many cases it is practically impossible in the early stages to distinguish between incipient stem rot and harmless leaf-base decay.

Ustulina zonata was found on decayed leaf bases of oil palm. A few cases were noted where it attacked the underground stem tissue by way of the roots, causing 'charcoal base rot' [ibid., xv, p. 647].

Poria ravenalae [ibid., xv, p. 78] was present on coco-nut stems showing decayed patches on one side below the crown.

Yellow and white bacteria, *Penicillium* sp., *Thielaviopsis* sp., yeasts, and *Marasmius palmivorus* [ibid., xiv, p. 357] were isolated from pineapple fruitlet brown rot, the bacteria being the organisms most commonly found. The disease, which is prevalent in Singapore, Johore, and Selangor, is invisible until the fruits are skinned, and though it affects 24 to 60 per cent. of the fruits, the damage is so slight that under 1 per cent. have to be discarded. Pineapples are also affected by broken core, fruit collapse, chlorosis [ibid., x, p. 473], and heart rot. In the first, the core is broken across, generally towards the stalk end, where a cavity develops. Ripening proceeds from the crown downwards. Fruit collapse affects apparently firm and healthy fruits, which while ripening, suddenly soften and collapse in 24 hours, emitting a frothy liquid when squeezed. Chlorosis occurred on plants growing on peaty, acid soil. A few instances of heart rot with symptoms resembling those of *Phytophthora* heart rot [ibid., xv, p. 378] occurred in Johore, but no mycelium was detected in the affected tissue.

Tea in the Cameron Highlands was affected by a condition resembling *Armillaria mellea* [ibid., xvi, p. 564] root disease.

Liberian coffee was killed by *Ganoderma pseudoferreum* [ibid., vi, p. 514]. The leaves and flowers of *Crotalaria usaramoensis* and *C. anagyroides* showed a rust due, apparently, to an undescribed species of *Uromyces* which caused serious damage without killing the plants.

[Dwyer (R. E. P.).] **Report of the Economic Botanist. Year ended 30th June, 1936.**—*New Guinea agric. Gaz.*, iii, 1, pp. 11–18, 1937.

Chlorotic diseases of coco-nuts associated with soil deficiency and favouring infection by *Thielaviopsis* [*Ceratostomella paradoxa*: *R.A.M.*, xv, p. 136], *Pestalozzia palmarum* [ibid., xvi, p. 529], and other weak parasites, are very important in New Guinea, especially on old plantations. *Marasmius palmivorus* [see preceding abstract] was found in numerous localities on the stems of coco-nuts killed by lightning-strike [ibid., xii, p. 506].

An obscure condition of coco-nut known as 'head droop' is particularly prevalent in New Ireland. The top bends over in a complete semicircle and the leaves form a rosette, the lower leaves being few, short, and in a dying-back condition. Frequently, the entire stem may form a loop or become S-shaped. Production finally ceases, and the spathes die back completely. Many palms recover and show the condition on further occasions.

Coffee thread blight (*Corticium koleroga*) [ibid., xvi, p. 314] was somewhat severe in the native areas on the Keranat demonstration plantation. In the principal coffee areas of New Guinea root rots are the most formidable diseases, the coffee having been planted in new clearings before the stumps and roots had completely decayed. Among the fungi found were *Rosellinia pepo* and *Ganoderma subrugosum* (Pat. & Boisd.).

Forty-ninth Annual Report of the Kentucky Agricultural Experiment Station for the year 1936. Part I.—63 pp., 1937.

In 1936 two new stalk diseases of tobacco were recorded in Kentucky, one being a stalk rot of dark tobacco due to a species of *Rhizoctonia* closely resembling *R.* [*Corticium*] *solani*, and the other a phloem

necrosis of the stalk of nearly mature Burley tobacco possibly due to *Bacillus* [*Erwinia*] *aroideae* [*R.A.M.*, xvi, p. 637].

The second generation of a cross between the mosaic-resistant Ambalema tobacco [ibid., xiv, p. 401] and the highly susceptible White Burley gave a few White Burley plants apparently as resistant to various strains of mosaic as Ambalema. In a study of the inheritance of mosaic resistance and the sensitivity factor of Ambalema and its hybrids about 600 F_2 plants of Burley 16×Ambalema, the former susceptible and non-sensitive, and the latter resistant and sensitive, were inoculated in the field with the white mosaic strain, and resistant plants appeared in the ratio of 1 : 12·6, suggesting two pairs of factors for resistance.

For the fourth year in succession there was little evidence that the mosaic virus in the dead roots of tobacco plants was an important source of infection [ibid., xiv, p. 685; xvi, p. 500]. Among 800 plants growing in soil in which infected tobacco had grown the summer before, only one developed mosaic of a strain used the previous year. When the stalks and leaves from the diseased plants of the previous year were cured, ground up, and added to land shortly before setting, the addition of stalks and leaves showing mosaic burn increased the percentage of mosaic in the crop from 0 and 1·2 to 37·1 and 8·5, respectively, the corresponding figures for yellow mosaic being 2·0 and 0·8 to 12·5 and 13·0, respectively.

In 84 fields of dark tobacco where the growers chewed or smoked home-cured tobacco while handling the plants the average infection just before cutting amounted to 39·9 per cent., whereas in 29 fields where home-cured tobacco was not so used the figure was only 1·8 per cent. Experimental evidence indicated that cured leaf to be used by growers for chewing or smoking should be heated to 110° C. for 5 hours to inactivate completely the infectious agent. Disinfection of the workers' hands by dipping four times in a concentrated solution of trisodium phosphate, followed by light rinsing, reduced the transmission of mosaic in one experiment from 90 per cent. to nil. It is recommended that the workers should dip their hands into this chemical occasionally while pulling or weeding.

Hybridization between White Burley varieties susceptible to *Fusarium* wilt [*F. oxysporum* var. *nicotianae*: ibid., xv, p. 614] produced two moderately resistant and good quality varieties.

The toxin produced in broth cultures of *Bacterium tabacum* [ibid., xvi, p. 566] was soluble in glacial acetic acid but not in ether, chloroform, xylene, benzene, carbon tetrachloride, or ethyl alcohol. Preliminary inoculations of tobacco with different isolants of *Bact. angulatum* [loc. cit.] and *Bact. tabacum* indicated that there are strains of each varying in pathogenicity.

Clover varieties in an experimental field were killed off by *Sclerotium bataticola* [*Macrophomina phaseoli*: ibid., xiii, p. 14].

OSMUN (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1936* (*Bull.* 339), pp. 25–32, 1937.

This report [cf. *R.A.M.*, xv, p. 484] contains among others the following items of interest.

In investigations into the control of greenhouse vegetable diseases E. F. Guba found that burning sulphur at the rate of 4 lb. per 10,000 cu. ft. as a between-crop treatment completely killed all fungal spores. *Cladosporium fulvum* [ibid., xvi, p. 571] is stated to be a not uncommon cause of asthma among greenhouse workers [see below, p. 676].

In vegetable seed treatments against damping-off conducted by C. J. Gilgut and E. F. Guba, red copper oxide [see below, p. 715] gave the best results with lettuce, pepper [*Capsicum annuum*], carrot, eggplant, tomato, squash, and beet, zinc oxide with radish, turnip, cucumber, parsnip, spinach, and lima bean [*Phaseolus lunatus*], semesan with beans, onion, peas, cabbage, and cauliflower, and either semesan or semesan jr. with maize. Hot water treatment of eggplant seed at 120° to 125° F. for 30 mins. was effective against *Verticillium* [*albo-atrum*: ibid., xiv, p. 684] but the fungus is too prevalent in soils for the treatment to be of value.

Powdery mildew of greenhouse cucumbers [*Erysiphe cichoracearum*: see above, p. 653] was controlled by spray applications every 10 days of Bordeaux mixture 1–1–50, corona copper carbonate 50 per cent. at 1–50 and 18 per cent. at 2–50 and 3–50, mike-sulfur 2–50, potassium sulphide 1–50, and other sprays, ½ pint of penetrol [ibid., xv, p. 195] being added per 50 galls. of each. None of the treatments caused objectionable staining.

In two field tests on the control of *Alternaria dianthi* [ibid., xiv, p. 684] carnations were given 10 and 13 applications, respectively, of Bordeaux mixture 5–5–50, calcium arsenate 1 lb., and penetrol ½ pint, with the result that in the former the sprayed and unsprayed plants showed 96 and 1,630 infected stems, respectively, and in the latter 51 and 2,556, respectively.

W. L. Doran found that seedlings of herbaceous ornamentals made better growth in sand and sphagnum or sand and peat moss than in sand alone [ibid., xv, p. 547, and below, p. 677], but showed more damping-off, which was, however, practically negligible as compared with the amount present in soil. If soil is used for growing the seedlings it should be disinfected with formaldehyde dust or acetic acid dust. The same worker ascertained that the time of taking cuttings of woody plants affected their rooting as much as any other factor, including the presence or absence of soil fungi. Fairly hard cuttings of several species lived and struck root as well in sand or sand and peat moss inoculated with species of *Pythium* or *Rhizoctonia* as in the absence of the fungi. Cuttings taken earlier or when softer were more susceptible to infection, but when taken too late struck root less well.

A severe disease of the above-ground parts of several varieties of *Thymus serpyllum* was caused by *R.* [*Corticium*] *solani*. Infection was prevalent in rainy weather during early summer.

Silayan (H. S.). **Annual Report of the Director of Plant Industry, Commonwealth of the Philippines, for the fiscal year ending December 31, 1936.**—178 pp., 18 pl., 2 graphs, 1937.

In the section of this report [cf. *R.A.M.*, xv, p. 79] dealing with plant pathology (pp. 119–127) the following items, *inter alia*, are quoted.

Sclerotia of *Sclerotium oryzae* [*Leptosphaeria salvinii*: ibid., xvi, p. 405] were killed by immersion in mercuric chloride solution (1 in 1,000 for $2\frac{1}{2}$ mins.).

In field trials under wet and dry seasonal conditions the Virginia Jumbo and Tai-tan varieties of groundnut consistently showed strong resistance to *Sclerotium* wilt [*S. rolfsii*: ibid., xv, p. 325] and high yield, whereas the Valencia and Georgia Red varieties were susceptible. Rainy weather greatly favoured the progress of infection.

Tomato leaf mould (*Cladosporium fulvum*) [see preceding abstract] was first recorded from the Philippine Islands in 1934, in Bagnio, Mountain Province. It causes more damage in the glasshouse than in the field, and may appear at any time of the year, becoming most serious in cold, damp weather.

In the selection of garden beans [*Phaseolus vulgaris*] for disease resistance the promising pole varieties Chinese Wax and Blackbean were resistant to leaf spot [? *Cercospora lussoniensis* = *C. cruenta*: ibid., iv, p. 76; xvi, p. 585], anthracnose [*Colletotrichum lindemuthianum*] and rust [*Uromyces appendiculatus*], while Genuine Cornfield was very susceptible to anthracnose, but apparently resistant to leaf spot. Of the dwarf varieties, Canadian Wonder, Longfellow, Prolific Black Wax, and a native white-seeded bean (Lepanto) were resistant to anthracnose and rust, but susceptible to leaf spot.

Definite control of cacao black pod (*Phytophthora palmivora*) [ibid., xv, p. 705] resulted from spraying with Bordeaux mixture and soap before the buds appeared, as soon as they were set, and then once every three weeks until the first harvest.

In attempts to cultivate *Volvaria esculenta* [ibid., xv, p. 422] and other edible mushrooms the best germination was given by spawn 90 to over 100 days old; the largest crops were given when rice straw with abacá [*Musa textilis*] trimmings or rice straw alone was used, and the beds were covered with galvanized iron sheets to conserve moisture and afford protection against the effects of heavy rains.

MAGROU (J.) & LOMINSKI (I.). **Propriétés humorales non spécifiques de certains tissus végétaux.** [Non-specific humoral properties of certain plant tissues.]—*C.R. Soc. Biol., Paris*, cxxv, 16, pp. 224–227, 1937.

Details are given of agglutination experiments on *Pelargonium*, the results of which clearly demonstrated that these plants are endowed with non-specific humoral properties differing with the presence or absence of tumours caused by *Bacterium tumefaciens* [*R.A.M.*, xvi, p. 590]. The juices of tumour-bearing stems are haemo-agglutinating, anticomplementary, and precipitate guinea-pig and white of egg serum at considerably higher dilutions than do those of the tumours themselves or of healthy plants. Thus, crown gall infection, which is expressed locally by tumour production, involves a general modification of the plant constitution discernible by serological methods.

STRAIB (W.). **Die Untersuchungsergebnisse zur Frage der biologischen Spezialisierung des Gelbrostes (Puccinia glumarum) und ihre Bedeutung für die Pflanzenzüchtung.** [The results of studies on the

problem of biologic specialization in the yellow rust (*Puccinia glumarum*) and its importance in plant breeding.]—*Züchter*, ix, 5, pp. 118–129, 1937.

This is a tabulated review of the results of recent studies in Germany and elsewhere on biological specialization in the yellow rust of wheat (*Puccinia glumarum*) [*R.A.M.*, xvi, pp. 372, 524], with special reference to its bearing on the work of breeding for resistance to the disease. From a consideration of the problem as a whole there would appear to be every prospect of the successful development of satisfactory commercial rust-resistant selections of wheat and barley. There are no special genetic complications in the combination of rust resistance with other desirable characters, and the inoculation of appropriate crosses with the chief biological races of the rust is a simple and reliable method of eliminating susceptible material.

LAUMONT (P.). **Observations sur la récolte des céréales en Algérie (campagne 1935–1936).** [Observations on the cereal yield in Algeria (season 1935–1936).]—*Bull. Soc. Agric. Algérie*, lxxix, 496, pp. 132–152, 1936. [Received April, 1937.]

Exceptionally severe damage was caused in Algeria in 1936 by *Puccinia graminis*, especially in the Chéliff plain and the Mascara district, where the wheat crop was a practically total failure. Extreme susceptibility to the disease was shown by the late maturing varieties, Hedba 3, Langlois 1527, and Tlemcen 277 and 294, the only resistant commercial sort being Oued Zenati 368. All the new early wheats of Indian or Australian extraction proved very susceptible to *P. glumarum*.

Ophiobolus graminis contributed locally to the severe yield reductions of 1935–6 and is likely to spread with the extension of the susceptible Baroota, Florence-Aurora, and certain Pusa varieties.

In connexion with the alarming increase of loose smut of wheat (*Ustilago tritici*) in Tunis (from 1 to 1·5 per cent. in 1934 to 25 per cent. in 1936 according to the author's unpublished data) and Algeria, directions are given for the control of the disease by the hot water treatment [*R.A.M.*, xvi, p. 444].

FRIEDRICHSON (G. A.). Ржавчина Пшеницы в условиях орошаемого Заволжья. [Wheat rusts in the irrigated districts of the Trans-Volga region.]—*Pl. Prot., Leningr., 1937*, 12, pp. 35–50, 1937.

The results of investigations, started in 1934, showed that winter and spring wheats in the semi-arid districts to the east and south-east from Saratoff, on the left banks of the Volga, suffer most from brown and black rusts (*Puccinia triticina* and *P. graminis*); yellow rust (*P. glumarum*) though present, is of no economic significance. Spring-sown wheats were shown to become infected with brown rust from winter wheats, on which the rust overwinters in the uredo stage, and the closer the former crops were to the latter the greater was the percentage of rust infection. The problem of the spring infection of the wheats with black rust remains unsolved, since it was not observed to overwinter in the region on the winter crops, barberry is practically non-existent, and in 1935 uredospores of *P. graminis* were only detected in the air 12 days

after the appearance of black rust pustules on the wheats, excluding the possibility of the introduction of infection by air from other regions. Special tests showed that irrigation of the fields before sowing did not increase the severity of the rusts, but repeated irrigation tended to increase the susceptibility of the susceptible varieties, especially when effected at periods most favourable for the growth of the hosts, i.e. seven days after the beginning of tillering, and seven days after the beginning of ear formation. In slightly susceptible varieties, however, such as Hordeiforme 432, Melanopus 69, and the hybrid 432×62, repeated irrigation did not increase the percentage of rust infection. Early sown spring wheats appeared to suffer less from rust than later sowings. Experiments with fertilizers showed that susceptibility was increased by nitrogen; phosphorus alone did not affect susceptibility to the same degree as nitrogen, but in combination with it acted as nitrogen alone. A well-balanced fertilization with combined nitrogen, phosphorus, and potassium gave the lowest incidence and intensity of the rusts.

Vaviloff (N. I.). Новые достижения по борьбе с ржавчиной за границей. [New achievements in rust control abroad.]—*Pl. Prot., Leningr.*, *1937*, 12, pp. 5–10, 1937.

The author gives a summarized account of trials in the U.S.S.R. of a number of United States and Canadian new wheats resistant to rust [*Puccinia* spp.], most of which have not yet been concluded. The greatest promise of adaptability to Russian conditions is apparently offered among the spring wheats by Thatcher [*R.A.M.*, xvi, p. 589], a Minnesota cross between the Kanred×Marquis and Marquis×Iumillo hybrids; by the Canadian varieties Apex and Renown which are resistant to stem [black] rust [*P. graminis*], and the relatively older Canadian Kitchener, Marquis, and Garnet wheats; among the winter forms, the most promising results have so far been obtained with the Kansas wheats Illini Chief, Fulhard, and the Kanred×Marquis 214211 hybrid.

Sukhorukoff (K. T.) & Ovčarov [Ovtcharoff] (K. E.). **On the nature of immunity to rust.**—*C.R. Acad. Sci. U.R.S.S.*, N.S. (*1937*), xiv, 6, pp. 393–396, 1937.

With reference to the recent paper of Gretschushnikoff [*R.A.M.*, xv, p. 710], who found urea and high concentrations of ammonia in various plants infected with rusts [*Puccinia* spp.] and interpreted these substances as toxins elaborated by the parasites, the authors give a tabulated account of biochemical tests, the results of which showed that in the leaves of healthy, 20-day-old wheat plants grown in the greenhouse at normal light intensity, the amount of ammonia decreased progressively from 35·5 mgm. per 100 gm. fresh weight in the highly rust-resistant *Triticum timopheevi* to 24·5 mgm. in the susceptible *T. vulgare* var. *lutescens* No. 062, the two intermediate species tested, *T. monococcum* and *T. durum* var. *hordeiforme*, yielding 32·0 and 28·0 mgm., respectively. Further tests showed that keeping the wheat plants in darkness, which was shown by Gassner [ibid., vii, p. 82] to prolong the development of rusts, considerably increased the amount of ammonia contained in the leaves (from 14 to 25·9 mgm. per 100 gm. fresh leaves

after 10 days in *T. durum* var. *hordeiforme*, and from 6 to 54·9 mgm. in *T. vulgare* var. *lutescens* No. 062). Urea was also found in leaves of *T. timopheevi* (15·2 mg.) and wheat (21·0 mg.). The ammonia content of a variety had no relation to the activity of its urease, though in the presence of this enzyme (which was activated by shading) urea readily passes into ammonia. From their studies the authors conclude that resistance to rusts in wheats is a direct function of their content in ammonia, which, moreover, is a hereditary character of wheat varieties, modified by environmental conditions.

NAOUMOVA (Mme N. A.). Естественные колебания температуры и продолжительность инкубационного периода **Puccinia glumarum f. tritici (Erikss. et Henn.).** [Temperature fluctuations in nature and duration of incubation period of *Puccinia glumarum* f. *tritici* (Erikss. & Henn.).]—*Pl. Prot., Leningr., 1937*, 12, pp. 51–66, 2 graphs, 1 diag., 1937. [English summary.]

This is a full report of the author's experimental work in the greenhouse in Leningrad with wheat yellow rust (*Puccinia glumarum* f. *tritici*), a brief summary of which has already been noticed from another source [*R.A.M.*, xv, p. 784]. It was shown that the shortest incubation period (eight days) occurred with the diurnal temperatures fluctuating between 15° and 25° C., and the longest (21 days) at temperatures between 3° and 5°. The minimum temperature for infection was found to be 3°, the optimum between 5° and 11°, and the maximum 23°. The critical temperature for the appearance of the rust pustules was a night minimum of 2° and day maximum of 24° to 25°. At average diurnal temperatures of 20° the pustules ripened in one to two days, and at temperatures of 8° to 10° in from two to five days. It is considered that the correlation established between temperature and the type of infection on germinating wheat, the appearance of chlorotic spots, and the size, colour, and number of pustules on the hosts may be of importance in the differentiation of physiologic races of yellow rust, and may also be used in forecasting local renewal of the rust in the spring. On the territory of the U.S.S.R. yellow rust is stated to be most widespread in the Central Asian Republics.

BUBENTZOFF (S.). Методика выделения головневого гриба **Ustilago tritici (Pers.) Rostr.** из зараженных семян Пшеницы. [A method for the isolation of the smut fungus *Ustilago tritici* (Pers.) Rostr. from infected Wheat grain.]—*Pl. Prot., Leningr., 1937*, 12, pp. 89–94, 1937. [English summary.]

In order to ascertain the percentage of loose smut (*Ustilago tritici*) infection in wheat samples, before and after disinfection, the author elaborated the following method of isolation. The grain was disinfected with mercuric chloride, steeped in sterile water for 24 hours, disinfected again, broken into pieces or crushed, sown on potato glucose agar, and incubated at 25° to 27° C. In one experiment this method gave 60 to 75 per cent. infected grain, as compared with 64 to 72 per cent. as determined by anatomical analysis.

SABUROVA (Mme P. V.). Определение заболевания Пшеницы пыльной головней по формирующемуся колосу. (Предварительное сообщение). [Determination of loose smut infection in Wheat by the developing ear. (Preliminary note).]—*Pl. Prot., Leningr., 1937*, 12, pp. 171–173, 2 figs., 1937.

This is a summarized account of experiments, the results of which showed that infection in wheat plants with loose smut [*Ustilago tritici*] may be diagnosed within a month or even less from sowing by the following abnormalities in the rudimentary ear, namely: (*a*) the absence of awns in awned varieties, (*b*) brown streaks extending over the whole length of the ear, especially conspicuous at its apical portion, and consisting of accumulations of chlamydospores, and (*c*) flattened shape of the spikelets which tend to stand away from the rachis, whereas in healthy plants the spikelets are convex in the middle and adhere firmly to the rachis.

ANGELL (H. R.), HELY (F. W.), & ALLAN (Miss F. E.). **The effect of Urocystis tritici Koern. on the extent of development of the roots and aerial parts of the Wheat plant. I.**—*J. Coun. sci. industr. Res. Aust.*, x, 2, pp. 136–142, 1937.

The results of statistical study indicated that flag smut (*Urocystis tritici*) [*R.A.M.*, xvi, p. 305] of wheat causes in the root system a reduction which is influenced by environmental conditions and is more pronounced in plants grown in the winter than in those grown in the spring. The root system of the susceptible Federation variety was less affected than that of Ford (moderately resistant) and Nabawa (resistant). In the first-named variety the weight of the tops was significantly reduced by infection, but was increased in the case of Nabawa, while there was a significant reduction for Ford in one experiment but not in another.

RAABE (A.). **Helminthosporium tritici vulgaris Nisikado Erreger einer Blattfleckenkrankheit des Weizens.** [*Helminthosporium tritici vulgaris* Nisikado, the agent of a leaf spot disease of Wheat.]—*Phytopath. Z.*, x, 1, pp. 111–112, 2 figs., 1937.

Helminthosporium [or *Drechslera*] *tritici-vulgaris* [*R.A.M.*, x, p. 233] is stated to have been responsible for extensive damage to wheat and spelt in the Tübingen district of Germany in 1935, reappearing in a milder form in 1936. This is believed to be the first record of the disease in Europe. Under local conditions the fungus forms on the leaf blades oval or lanceolate, later confluent, yellowish- to greyish-brown lesions, up to 2 cm. long and several mm. in width. The brown, transversely septate conidiophores are mostly straight, 90 to 220 by 6 to 11 (usually 9) μ, and the pale olive or almost colourless, cylindrical, obtuse-ended, 3- to 13-septate conidia measure 80 to 270 by 15 to 19 μ.

THOMAS (R. C.). **The role of certain fungi in the 'sick Wheat' problem.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 185, pp. 43–45, 1937.

Isolations from the outer coat of 'sick wheat' (i.e., wheat threshed and stored with a relatively large amount of moisture present and containing only 20 to 25 per cent. viable grains) gave 13 different fungal

species and strains, including six different species of *Penicillium*, three of *Aspergillus*, one each of *Alternaria* and *Helminthosporium*, *Cephalothecium* [*Trichothecium*] *roseum*, and *Fusarium 'roseum'*. The toxicity of the filtrates through a Chamberland-Pasteur filter from 43-day-old cultures of these fungi when tested (by soaking for 24 hours at 25° C.) against good Fulhio wheat seed (91 per cent. germination) varied widely, germination ranging from 88 per cent. for wheat treated with filtrate from cultures of *F. 'roseum'* to only 43 and 22 per cent. for that from cultures of *Aspergillus flavus* strains 4 and 7, respectively. Filtrate from 73-day-old cultures of strain 4 was less toxic, while that of strain 7 maintained its toxicity, the effect of the filtrates being more masked in wheat germinated at 37·5° than at 8°. A spring wheat (Minn. 2223) tested against the extracts from 73-day-old cultures of both strains was more susceptible than Fulhio.

It is concluded that the fungi isolated exert a deleterious action of varying intensity on the wheat, but the association becomes significant only when the moisture content of the grain is high and the temperature favourable to mould growth.

WADA (E.) & FUKANO (H.). **On the difference and discrimination of Wheat mosaics in Japan.**—*J. imp. agric. Exp. Sta.*, iii, 1, pp. 93–128, 15 pl. (2 col.), 1937. [Japanese, with English summary.]

This is an expanded account of the writers' studies on wheat mosaic in Japan, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 618]. In addition to the familiar yellow and green forms of mosaic, a composite type has been observed in which the foliar mottling is yellow or brown, affected plants become dwarfed and their appearance ultimately resembles that of stands affected by green mosaic. Besides the two kinds of X-body (A and B) already described [loc. cit.], associated with green and yellow mosaic, respectively, a third intermediate type (M) has been observed occurring in a variable ratio, together with the two foregoing, in plants suffering from the composite form. Sometimes type M resembles B but with some vacuoles, sometimes type A with badly differentiated vacuoles and rough margin. The results of varietal reaction tests showed that Haya-Komugi is susceptible to both green and yellow mosaic, Kumamoto-Komugi No. 1 to yellow but not to green, and Saikoku-Hozoroi to green but not to yellow. Of 30 soil types examined, 8 were found to be conducive to the development of green mosaic, 4 to that of yellow, and the remaining 18 to that of both forms of the disorder. Two different viruses, acting singly, are believed to be responsible for the green and yellow mosaics, while the composite type results from their joint operation.

HUSEMANN (C.). **Grundlagen und Möglichkeiten der Ertragssteigerung und -sicherung auf sogenannten heidemoorkranken, ertragsunsicheren Sand- und Humusböden.** [Foundations and possibilities of yield increase and assurance on the so-called 'heath moor-diseased' sand and humus soils of uncertain productivity.]—*Z. Pfl-Krankh.*, xlvii, 4, pp. 211–232, 1937.

A tabulated account is given of four years' experiments (1933 to 1936, inclusive) on the influence of appropriate cultural methods and of

various fertilizers on the health and yield of crops liable to suffer from reclamation disease in a sandy moorland soil with a fluctuating humus content and fairly acid reaction in the Stade district of north Germany [*R.A.M.*, xv, p. 792].

The general condition of the crops (winter and summer rye, black oats, potatoes, lupins, and serradella [*Ornithopus sativus*]) was found to respond favourably to rational field sanitation, comprising, for instance, improvements in the physical structure and constitution of the soil, plentiful applications of synthetic fertilizers, judicious crop rotation, and timely sowing of summer cereals, quite apart from the indisputably beneficial effects of copper sulphate (50 or 100 kg. per hect.). The exact nature and extent of the amelioration induced by the last-named treatment can only be gauged by a protracted series of observations involving statistical data on the yields obtained in trial plots.

LING (L.) & MOORE (M. B.). **Influence of soil temperature and soil moisture on infection of stem smut of Rye.**—*Phytopathology*, xxvii, 5, pp. 633–636, 1937.

In a series of experiments in constant temperature tanks in the greenhouse at University Farm, St. Paul, Minnesota, in 1932 and 1934 to determine the influence of soil temperature and moisture on the incidence of *Urocystis occulta* on Dakold and Rosen rye [*R.A.M.*, xiv, p. 30], infection was prevalent at a range of 5° to 25° C., with an optimum from 13° to 17°. It is possible that the lower optima are correlated with shallow planting. High soil moisture (65 per cent. of the water-holding capacity) reduced the amount of infection and may also have restricted the temperature range of fungal activity.

MARCY (D. ELIZABETH). **Inheritance of resistance to the loose and covered kernel smuts of Sorghum. II. Feterita hybrids.**—*Bull. Torrey bot. Cl.*, lxiv, 5, pp. 245–267, 2 graphs, 1937.

Continuing her studies on the genetics of the resistance of sorghum hybrids to *Sphacelotheca cruenta* and *S. sorghi* [*R.A.M.*, xvi, p. 598 and cf. next abstract], the author found from infection reactions with *S. sorghi* that when the resistant Dwarf Yellow milo variety was crossed with feterita (resistant, but producing blasted heads when the seedling environment strongly favoured infection), approximately $\frac{1}{16}$ of the F_2 plants were susceptible. This confirmed the assumption that these varieties possessed different factors for resistance. When Dwarf Yellow milo was crossed with the susceptible varieties Shallu, Dakota Amber sorgo, Dawn kafir, and Sumac sorgo, approximately $\frac{1}{4}$ of the F_2 plants were susceptible, indicating that Dwarf Yellow milo brought into the crosses a factor for resistance (R) completely epistatic to a factor for susceptibility (S) brought in by the susceptible varieties.

When feterita was crossed with the susceptible varieties, the results indicated the interaction of S and a factor for resistance brought in by feterita (B). Under conditions strongly favouring infection S was epistatic to B, segregation in the F_2 generation, as reconstructed from F_3 data, approximating to the ratio of 13 infected to 3 healthy plants. When conditions were less conducive to infection, the F_2 ratios approxi-

mated to 3 resistant plants to 1 susceptible. It was therefore concluded that hybrid plants containing both S and B were extremely unstable in their reactions to *S. sorghi*, and that the epistasis of S over B or B over S was entirely dependent on the environmental conditions prevailing during germination.

Results with *S. cruenta* indicated that when Dwarf Yellow milo was crossed with the susceptible varieties there was a two-factor interaction similar to that of feterita hybrids inoculated with *S. sorghi*. When feterita was crossed with the susceptible varieties resistance was dominant, and the interaction of three factors was indicated. No infected plants resulted from the crosses of feterita with Dwarf Yellow milo, indicating that these varieties possess at least one common factor for resistance. Possibly the factors governing reaction to *S. sorghi* may also determine the reaction to *S. cruenta*, but in a reverse sense.

RODENHISER (H. A.). **Echinulation of chlamydospores and the pathogenicity of a previously undescribed race of Sphacelotheca cruenta.**—*Phytopathology*, xxvii, 5, pp. 643–645, 1937.

Ninety monosporidial lines of the F_1 hybrid of a cross between an F_3 inbred line of *Sphacelotheca sorghi* and a similar one of *S. cruenta* [*R.A.M.*, xiv, p. 438 and preceding abstract] were back-crossed to the recessive *S. sorghi* parent, and evidence was obtained of the segregation of factors governing various constitutional characters, including chlamydospore texture. Of 85 chlamydospores of the original 90 progeny of the back-cross examined, 48 were echinulate and 37 smooth. Segregation of echinulate and smooth chlamydospores in relation to sorus type in the hybrid progeny was as follows: in 14 of the *S. sorghi* type, 9 had smooth chlamydospores and 5 echinulate, the corresponding figures for 49 *S. cruenta* type being 19 and 30, respectively, and for 22 intermediate type, 10 and 12, respectively. A collection of *S. cruenta* on Johnson grass [*Sorghum halepense*] with very prominently marked chlamydospores proved to be apparently a new physiologic race; it was highly pathogenic to the plants of a kafir×feterita (sorghum) cross in two series of inoculation tests (84·1 and 80 per cent. infection) but was innocuous to Reed kafir, Dwarf Yellow milo, and Pierce kaferita; Sudan grass [*Sorghum sudanense*] and Johnson grass contracted 17·9 and 46 per cent. infection, respectively, in the first series and 15·9 and 43·3 per cent., respectively, in the second.

CHEEMA (G. S.), KARMARKAR (D. V.), & JOSHI (B. M.). **The cold storage of Nagpur Oranges (Citrus aurantium).**—*Indian J. agric. Sci.*, vii, 1, pp. 169–175, 1937.

The authors describe investigations, carried out at Poona, on the cold storage of Santra oranges. The fruit, after 2 days in transport from Nagpur, was graded as green, turning, and yellow or fully ripe, and stored in trays at temperatures of 35°, 40°, 45°, and 52° F. in a humidity of 80 to 90 per cent. It was found that fully ripe fruit could be kept in good condition for three months at 40° without appreciable wastage; but green and turning fruits, though acquiring a good yellow colour at 45° and 52°, lost their juice during storage.

In the early part of the storage period 'dark button', a brown

discoloration of the stem-end of the fruit, was specially observed in green and turning fruits, spoiling their appearance but not damaging the pulp. In only one case was a fungus (*Diplodia* sp.) [? *D. natalensis*: *R.A.M.*, xvi, p. 601] isolated.

Internal breakdown, apparently a physiological disorder, occurred at 35° and 40°, rarely at 45° and 52°, producing a bitter taste and an odour of fermentation, the skins becoming pale brown, dull, and collapsed. Fruit thus affected, when incubated, developed only a growth of *Penicillium*, though *Diplodia* was found in one case.

Appreciable wastage, at 45° and 52°, was caused by *Alternaria* [? *citri*: loc. cit.], infection taking place through 'dark button' and spreading to the pulp, the inside of the fruit becoming nearly black.

Washing fruit with water, copper sulphate, potassium permanganate, or borax solutions, coating with zinc oxide or magnesium oxide powders or paraffin wax, and wilting at room temperature, before storage, failed to control wastage.

Frost hastened development of machines for segregating Citrus.—*Calif. Citrogr.*, xxii, 7, pp. 298–301, 2 figs., 1937.

Frost injury in January, 1937, accelerated the development of two new American machines for detecting internal defects of citrus fruit. One of these, manufactured by the Citrus Machinery Co., Riverside, is an X-ray device working on the same principle as that recently described [*R.A.M.*, xvi, p. 452]. Each machine is fitted with two X-ray tubes and screens for four operators, and each operator is enabled to examine 90 to 120 fruits per minute, discarding faulty ones by means of a foot key. It is claimed that *Alternaria* decay [*A. citri*] can be detected in addition to other defects.

The other machine, invented by H. C. Pierce of Anaheim, depends in principle on the difference in electrical resistance between sound and defective fruits, 'mushy' fruits being less, and dry fruits more resistant than sound. Metal fingers are brought into contact with each fruit as it passes through the machine, the resulting flow of current actuating segregating machinery. It is asserted that granulation, *Alternaria* and other rots, breaking down, and dryness due to freezing can be detected.

Fawcett (H. S.) & Klotz (L. J.). **A new species of Candelospora causing decay of Citrus fruits.**—*Mycologia*, xxix, 2, pp. 207–215, 6 figs., 1937.

In January, 1932, a new fungus was isolated in Florida from an orange fruit showing a firm type of decay, the rotted area being slightly sunken, with a definite margin, brown on the surface, and brownish through the albedo and for a short distance inward on the divisions between the segments. Inoculations with the organism in injuries in the rind of oranges, lemons, and grapefruits gave a similar rot, with spots cinnamon-brown to Prout's brown on Valencia oranges, and mars brown on light green lemons in which the internal discoloration was similar in extent but darker than that due to *Alternaria citri*. The fungus was reisolated from the artificially infected fruit.

The optimum, minimum, and maximum growth temperatures of the fungus on glucose potato agar were, respectively, about 25°, above

7·7° but below 11·8°, and over 30·4° but under 35°. A similar relation was indicated for rate of decay on mature oranges and lemons, but with green fruits the rate of decay was not only lower at all temperatures tested, but the optimum temperature for lesion formation was much lower than on mature fruits.

The fungus, which belongs to the genus *Candelospora*, is characterized by conidiophores 14 to 23 μ long, occurring singly or severally on a torch-like hypha at a point 60 to 90 μ from its base; the conidiophore bears rami, metulae, sterigmata, and triseptate, cylindrical, obtusely ended conidia, 43 to 48 by 4·1 to 4·8 μ; the torch-like projection measures 240 to 275 μ long, 5 to 6 μ wide at the base, 2·5 to 3 μ wide at the narrowest point, and with swollen ends measuring 19 to 21 by 11 to 12·5 μ. No mucus was observed. The fungus differs from the only species of the genus previously known, *C. ilicicola*, in its smaller spores, fawn to vinaceous mycelium instead of white tufts, the lack of mucus in the heads, and the presence of torch-like hyphae from which conidiophores grow out. It is named *C. citri* n. sp. [with a diagnosis in English only].

PARKER (E. R.). **Experiments on the treatment of mottle-leaf of Citrus trees. III.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 213–215, 1937.

In further investigations into the control of citrus mottle leaf in California [*R.A.M.*, xvi, pp. 93, 378], Washington Navel oranges receiving 32 different fertilizer treatments since 1927 were sprayed in March, 1934, with zinc sulphate and lime applied at a strength of 10–5–100 with 4 oz. of powdered blood albumin spreader added. The treated trees quickly improved, many showing decreased mottle leaf and increased vigour by June, 1934. The mean tree-condition index (based on the amount of mottle leaf present and degree of thriftiness) for all the different fertilizer treatments for the three years before the treatment was estimated at 42·3, the corresponding figures for the untreated and treated areas in February, 1935, being 53·3 and 79·4, respectively. The improvement brought about by the treatment was maintained in 1935–6. An increase in yield of about 6·5 per cent. resulted from the treatment in the crop of 1934, while the same trees in 1935 showed an increase in yield of 24 per cent. over the trees treated just before the 1935 crop was set, the increase in yield being much greater in the second than in the first season after treatment. The yields of the 1934 crop were increased by the zinc treatment in 25 of the 32 fertilizer treatments involving the application of 1 lb. nitrogen per tree. The 1935 crop was increased by the zinc treatment in 30 of the fertilizer treatments and the yield of the other two was nearly as large. The most severely affected trees showed improved yield and condition.

DWYER (R. E. P.). **The diseases of Coco-nuts (Cocos nucifera) in New Guinea.**—*New Guinea agric. Gaz.*, iii, 1, pp. 28–93, 16 figs., 1937.

Full, popular notes, with numerous references to the relevant literature, are given on the causes, symptoms, and control of the diseases of coco-nuts observed in the Mandated Territory of New Guinea. These include bud rot (suspected to be present in the past but so far no species of *Phytophthora* has been identified on coco-nut); lightning-strike (causing false bud rot) [see above, p. 657]; root infections by *Ganoderma*

lucidum [*R.A.M.*, xv, p. 632], *Fomes lignosus*, and *F. noxius*; tapering stem (associated with soil erosion) [ibid., vi, p. 608; xvi, p. 300], chlorosis and die-back deficiency disease [see above, p. 657]; soft leathery kernel, suspected to be due to soil impoverishment; an obscure physiological trouble affecting palms five to eight years old in New Ireland and characterized by a pronounced tip withering of the central leaves, dying-back of the outer leaves, and pale brown streaks on the back of the petioles; nut fall, associated with environmental and soil conditions, insects, and various fungi; ring disease of immature nuts associated with *Botryodiplodia theobromae* [ibid., iv, p. 35]; head droop (corkscrew, cabbage droop, or strangle disease) [see above, p. 657]; frond choke (closely resembling little leaf of the West Indies) [ibid., xv, pp. 2, 128]; thread blights due to *Corticium penicillatum* [ibid., v, p. 716]; stem bleeding (*Ceratostomella paradoxa*) [ibid., xv, p. 15]; grey blight (*Pestalozzia palmarum*) [ibid., xvi, p. 529, and above, p. 657]; bacterial leaf blight due to an organism as yet unidentified; leaf droop, associated with poor soil; leaf break due to *Botryodiplodia*; tip wither [ibid., iv, p. 35] associated with *Botryodiplodia* and *Fusarium* spp., and 'silver leaf', causing a silvering of the leaf surface associated with an unidentified fungus.

PFÄLTZER (A.). **Culturmaatregelen in verband met eenige ziekten en plagen bij de Koffie.** [Cultural methods in connexion with some Coffee diseases and pests.]—*Bergcultures*, xi, 18, pp. 636–638, 1937.

In addition to the die-back of coffee branches associated with definite parasitic diseases, such as top die-back [*Rhizoctonia*: *R.A.M.*, xvi, p. 530, and next abstract] and pink disease [*Corticium salmonicolor*: ibid., xv, p. 345; xvi, p. 280], a form of this disorder may be induced in Java by adverse environmental conditions tending to disturb the equilibrium of the assimilatory functions. The health of trees suffering from this type of die-back may be improved by careful attention to the aeration and moisture of the soil, uniform shading, and restriction of bearing within reasonable limits.

MULLER (H. R. A.). **Topsterfte van Koffie.** [Top die-back of Coffee.]—*Arch. Koffiecult. Ned.-Ind.*, x, 4, pp. 280–349, 3 figs., 5 diags., 1 graph, 1936. [English summary. Received May, 1937.]

This is an exhaustive, fully tabulated account of the writer's investigations in Sumatra from 1928 to 1930 on the top disease of young coffee trees and the die-back of older ones due to *Rhizoctonia* [see preceding abstract], supplemented by some later observations on the same phenomena.

Transverse sections through the wood of affected trees show concentric rings of brownish spots and patches due to gum deposits in the infected vessels. Both phases of the disease are accompanied by tracheomycosis, and the fungus has been isolated from the wood, stems, and twigs. Infection has been found invariably to commence in a growing twig and may frequently be detected before the hyphae spread into the stem; in such cases timely pruning may arrest the further progress of the disease. In the field the fungus travels from the leaves through the

wood vessels of the branches and stem. As a rule its diffusion is two to three times more rapid in an upward than in a downward direction.

Positive results were obtained in inoculation experiments with pseudo-sclerotia of the organism on 14 out of 50 unwounded and on 26 out of 50 wounded plants (28 and 52 per cent., respectively). No other species of *Rhizoctonia* being known to cause tracheomycosis, the agent of top die-back of coffee may be regarded as a new species, a technical description of which will be published elsewhere. In pure culture the fungus proved highly sensitive to temperatures exceeding 25° C., and could only be kept alive in the laboratory at Buitenzorg (mean temperature 26·5°) in an iceless refrigerator (23·4°). The inability of the *Rhizoctonia* to withstand great heat probably accounts for its confinement to altitudes higher than 300 to 400 m. above sea-level. The propagation of the organism is assisted by its capacity to remain alive for about seven weeks in excised diseased top, twigs, and leaves left in the open. Pseudo-sclerotia, consisting of interwoven chains of pseudo-conidia, have been found in such material in the field and shown to be able to produce normal fungal colonies, the hyphae of which penetrated the leaves in inoculation tests.

The presence of abundant shade (*Leucaena glauca*) was observed to minimize the incidence of top die-back, and a close correlation was traced between the number of fresh infections and the monthly rainfall. In the dry monsoon the trees infected in the preceding wet monsoon die off, while in the first months of the wet season the number of diseased trees remains nearly constant owing to the heavy reduction of fresh infections during the foregoing dry spell. The yields of diseased trees are 16 to 50 per cent. lower than those of healthy ones, the production of two- and four-stemmed trees exceeding that of one-stemmed by about 20 per cent.

Some 35 per cent. of the shoots from diseased trees are infected by the migration of hyphae from the stem, but hyphae are frequently absent from the stem base opposite the diseased branches. After pruning back the infected trees to some distance below the visibly affected branches, shoots destined to replace the main stem should be retained only at the base of the 'healthy' side. Working along these lines, it was possible to reduce the number of hyphal infections of shoots from the old stem to between 3 and 9 per cent. Pruning experiments showed that the excision of the first diseased branches reduces the loss of branches by 25 per cent. or so. If the whole top is affected the stem should be cut back below the visibly diseased parts and treated as described above; in the case of old trees, however, sound young shoots are not likely to be produced and pruning should be limited to the removal of infected branches until the tree becomes worthless and has to be replaced by a young one. All prunings should be burnt to prevent the spread of infection. In spraying and dusting experiments with copper compounds in 1932–3 in Kediri (Java), the number of fresh attacks was reduced by 50 per cent., but this method of control is more expensive and less effectual than pruning.

Top die-back has been observed to affect *Coffea robusta* and its vars. *quillou* and *uganda*, *C. canephora*, *C. congensis*, *C. excelsa*, *C. dybowski*, *C. liberica*, *C. abeocuta*, and *C. arabica* and its var. *margogype*, the

last-named species and variety, however, being definitely resistant (12 per cent. infection compared with 80 per cent. in *C. robusta*).

KING (C. J.). **A method for the control of Cotton root rot in the irrigated south-west.**—*Circ. U.S. Dep. Agric.* 425, 9 pp., 3 figs., 2 diags., 1 map, 1937.

In the control of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xvi, p. 606] it is stated that a two- or three-year rotation with grain crops combined with deep tillage after the grain is harvested, has reduced the disease to some extent in Texas, while trench barriers containing mixtures of soil and heavy oils, ammonia, sulphur, and salt have also been used to limit the spread of the fungus. The following cultural method has proved very effective in Arizona for controlling the disease in irrigated cotton. Applications of organic materials are made in furrows 10 to 14 in. deep during the autumn and winter and covered by ploughing out the intervening ridges to form beds over the materials. Irrigation water should be applied immediately and, if possible, the operations should be completed at least a month before planting time, and a second irrigation made before planting. As much as 20 tons of horse or cow manure may be given per acre though 15 tons would probably be adequate for most soils; if green manure is available 30 tons per acre may be used. In experiments in 1935 only 1·6 per cent. of the cotton plants died on the treated plots compared with 56·2 per cent. for the untreated. The combined yield from control plots in 1932, 1933, 1934, and 1935, was 72, 54, 58, and 53 per cent., respectively, of that from the manured plots. In one experiment in 1935, after two years of treatment, the disease occurred on 9 per cent. of the treated area and on 50 per cent. of the untreated. The beneficial effects of the treatment, which should be continued for a period of years, are attributed to the inability of the root rot fungus to thrive in the presence of great numbers of soil organisms actively engaged in decomposing organic material.

VASUDEVA (R. S.). **Studies on the root-rot disease of Cotton in the Punjab. III. The effect of some physical and chemical factors on sclerotia formation.**—*Indian J. agric. Sci.*, vii, 2, pp. 259–270, 3 graphs, 1937.

Further studies on the cotton root rot in the Punjab caused by *Rhizoctonia bataticola* [? *Macrophomina phaseoli*] and *R.* [*Corticium*] *solani* [*R.A.M.*, xvi, p. 96] showed that for each fungus growth was about equal on Richards's agar and cotton root extract and synthetic agars, but that sclerotial formation was favoured by the last two media and was poor on Brown's agar. Both *M. phaseoli* and to a less extent *C. solani* manifested a positive correlation between the concentration of the medium and intensity of sclerotial formation. With *M. phaseoli* very few sclerotia developed on shallow media, sclerotial formation increasing progressively with increased depth of the medium, while with *C. solani* sclerotia were formed only on deep medium. *M. phaseoli* showed intense sclerotial formation on media with a P_H range of 3·3 to 7·8, there being a considerable reduction in the number but increase in the size of the sclerotia at P_H 7·8, while for *C. solani* P_H 6·8 was the

optimum for sclerotial development which declined on either side of this value. In the absence of either sugar, nitrogen, or phosphate, growth was poor and no sclerotia developed except a few on the sugarless medium. Synthetic media containing nitrogen in the form of ammonium salts exercised a toxic effect, while those containing calcium nitrate and peptone gave the best growth. The sclerotia of *C. solani* lost their viability when exposed to 3 per cent. ammonium hydroxide solution for five minutes, and those of *M. phaseoli* were killed by ten minutes' exposure to a 4 per cent. solution. The growth of both fungi was checked by the addition of 0·09 per cent. mercuric chloride, 0·3 per cent. copper sulphate, or 0·5 per cent. phenol solutions to the medium. Exposure to hydrocyanic gas killed the sclerotia under moist conditions within 45 minutes, whereas those exposed when dry were viable after a week. The gas killed the sclerotia of both organisms in moist soil down to a depth of 18 in. within six days.

DERRETT-SMITH (D. A.). **A portable ultra-violet fluorescence lamp for the examination of textile and other materials.**—*J. Text. Inst., Manchr,* xxviii, 5, pp. T 145–T 160, 8 figs., 1937.

An ultra-violet fluorescence lamp, the 'Vi-tan' (Thermal Syndicate, Wallsend), designed for the detection of causes of defects in textiles, consists of a vitreosil mercury vapour burner with solid electrodes and neon as an exciter, in a metal housing, and is very portable, readily permitting the scanning of pieces of material. Among the numerous applications of the lamp described by the author is the determination of distribution of mildew causing staining, fluorescent spots due to mildew and the 'tide marks' indicative of wetting being rendered clearly visible.

TARR (H. L. A.). **Brood diseases of the Bee.**—*Tabul. biol., Berl.,* xiv, 2, pp. 150–185, 2 graphs, 1937.

The available information on brood diseases of the bee, including the two fungal disorders, chalkbrood (*Pericystis apis*) [*R.A.M.*, xv, p. 217] and stone brood (*Aspergillus flavus*) [ibid., xi, p. 180], is presented in tabular form and briefly discussed in relation to current researches in Europe, Canada, and the United States. The bibliography comprises 53 titles.

GIMINGHAM (C. T.). **Hover Flies killed by a fungus.**—*Trans. Herts. nat. Hist. Soc. Fld Cl.,* xx, 3, pp. 155–156, 1937.

In August, 1936, flower heads of oats and plantains [*Plantago* spp.] in a waste corner of a field on the Hertfordshire–Bedfordshire boundary were observed to be covered with dead hover flies (Syrphids of the genus *Melanostoma*, probably *M. mellinum*), which had been killed by a fungus identified by T. Petch as *Empusa muscae* [*R.A.M.*, viii, p. 720]. A striking feature of the epidemic was the immense number (many thousands) of insects involved; frequently they occurred in dense clusters and hung in chains from the plants over an area of 30 to 40 sq. yds.

CHARLES (VERA K.). **A fungus on Lace Bugs.**—*Mycologia*, xxix, 2, pp. 216–221, 2 figs., 1937.

Lace bugs (*Leptopharsa heveae*) have recently been killed off in large numbers in Brazil by a fungus producing a film of mycelium over the insects. The fungus is characterized by white, later pale yellow or pale fuliginous hyphae 6 to 10 μ in diameter; erect, simple, tapering conidiophores, 100 to 450 μ long; 3 to 6 verticillate, flask-shaped phialides, 20 to 28 by 4 to 7 μ, attenuated into a sterigma 8 to 15 μ long; and apical, hyaline, oval conidia, 6 to 8 by 4 to 5 μ, which appeared to be pip-shaped owing to the presence of a gelatinous substance round them. The insects were attached to the under surface of the leaves by irregularly digitate rhizoids, which occasionally became septate, showing rhomboid, thick-walled cells.

The arrangement of the phialides was strikingly varied. Opposite phialides were occasionally noted, and single ones sometimes occurred at irregular intervals along the mycelium. In a few cases a second phialide developed from the basal cell of the original one and produced a spore, and in some instances a second sterigma developed from the upper part of the phialide. The wall was usually entire, but an occasional phialide or group of phialides showed protuberances about 4 μ long.

The fungus has certain affinities with Petch's *Verticillium hemipterigena* and his *Cladobotryum ovalisporum* but the former differs in the size and shape of the conidiophores, phialides, and spores while the sterigmata of the latter, though bearing some resemblance to the projections on the phialides of the author's fungus, are smaller and more nearly cylindrical, and the conidia are shorter. The author considers that the fungus most closely approaches *Hirsutella* and accordingly names it, with a Latin diagnosis, *H. verticillioides*.

DÓSA (A.). **Über das Trichothecium roseum.** [On *Trichothecium roseum.*] —*Derm. Wschr.*, civ, 18, pp. 548–549, 4 figs., 1937.

Trichothecium roseum, previously reported by Olàh in connexion with his studies on miscellaneous skin disorders in Hungary [*R.A.M.*, xiv, p. 694], appears to be unknown elsewhere as a human pathogen. The writer has also detected the fungus in one or two cases of superficial dermatological affections at Szeged. The cultural characters of the fungus are described. A vaccine prepared from the mycelium produced a reddening of the skin on subcutaneous injection into normal persons, while guinea-pigs reacted by persistent alopecia to the intracutaneous introduction of a sodium chloride suspension of the fungus, which was recovered from the affected area.

KLEIN (J. E.). **The relation of fungus infection of grain crops to vasomotor disturbances in man.**—*Ann. intern. Med.*, x, 11, pp. 1708–1715, 6 figs., 1937.

Following a brief introductory survey of previous literature on the insufficiently recognized relationship between the fungal contamination of cereal crops and human pathology, the writer reports the detection of *Claviceps purpurea* [*R.A.M.*, xvi, p. 447] conidia in samples of commercial rye flour and 'pumpernickel' bread [ibid., xii, p. 88], and of

Ustilago zeae spores in maize meal purchased in the retail market [ibid., xv, p. 223]. The possibility of grain fungus intoxication being a factor in the obscure etiology of acrodynia and other vasomotor disturbances is discussed and the reduction of such infections by modern chemical seed treatments and improved milling methods is urged.

PAYENNEVILLE (J.) & RIVALIER (E.). **Un cas d'épidermophytie exotique.** [A case of exotic epidermophytosis.]—*Ann. Derm. Syph., Paris*, Sér. 7, viii, 5, pp. 378–392, 7 figs., 1937.

A full account is given of the clinical manifestations and cultural and morphological characters of *Trichophyton rubrum*, isolated from extensive reddish lesions, suggestive of marginate eczema, in a French workman who had apparently contracted the infection two years previously in Indo-China [*R.A.M.*, xvi, p. 459]. Cultures of the fungus on various nutrient media, including glucose, beer wort, and cereal water agar demonstrated the extreme variability of the species. The abundant spindles are elongated, with blunted ends, consisting of 6 to 15 cells superimposed one upon another, sometimes straight but more often vermiform or sausage-shaped. They are borne laterally on the mycelium or terminally in groups on secondary branches on a short main branch; in the former case the spindles are sessile, in the latter pedunculate. Piriform aleuria also occur, while bi- to triseptate buds, constituting a transitional stage between the two organs, have also been observed.

OLÀH (D.). **Una nuova specie di Perikonia, la 'Perikonia keratitidis Olàh'.** [A new species of *Periconia*, '*Periconia keratitidis* Olàh'.]—*Atti Ist. bot. Univ. Pavìa*, Ser. IV, ix, pp. 155–159, 1937. [Latin summary.]

A description is given of a new species of *Periconia*, named *P. keratitidis* [with a Latin diagnosis] isolated from a case of human keratitis in Hungary. In culture the fungus forms on various media downy zonate colonies with a greyish-white, raised centre surrounded by a brown or nearly black zone, and then by a membranaceous, turbid, or waxy and powdery outermost zone. The hyaline or yellowish-brown, dichotomously branched hyphae measured 5 to 6·4 μ in diameter, while the erect conidiophores, 64 to 82 μ long, were hyaline towards the base, darker near the swollen apex, which was sometimes very finely toothed, and bore 12 to 18 ovoid or ellipsoid hyaline or light brown conidia measuring 12 to 19 by 7 to 10 μ. Inoculations of this organism into the cornea of a guinea-pig gave positive results.

BERNTON (M. S.) & THOM (C.). **The role of Cladosporium, a common mold, in allergy.**—*J. Allergy*, viii, 4, pp. 363–370, 1937.

Details are given of subcutaneous injection tests on four patients (two adult males and two female children) to determine the part played by a species of *Cladosporium* in the excitation of allergic conditions associated with chronic hay-fever and asthma [cf. *R.A.M.*, xvi, p. 533]. In all cases the administration of 0·05 c.c. of fungal extract in the dilution of 1 in 10,000 gave rise to a diffuse, inflamed swelling, 2 to 4 in. in diameter, at the site of injection, a result considered to justify the

employment of the extract in a course of desensitization treatments, which were highly successful in three out of the four patients. In this connexion mention is made of observations by H. M. Cobe (*J. Allergy*, iii, p. 389, 1932) and E. F. Guba (*Flor. Rev.*, lxxviii, p. 32, 1936) as to the development of similar pathological conditions in greenhouse workers exposed to contact with tomatoes infected by *C. fulvum* [see above, p. 659].

This paper was followed by a discussion in the course of which information as to the distribution of fungal allergic excitants in various regions of the United States was imparted by workers in the same branch of medicine.

NOVOGRUDSKI (D.), BEREZOVA (Mme E.), NAKHIMOVSKAYA (Mme M.), & PERVIAKOVA (Mme M.). **The influence of bacterization of Flax seed on the susceptibility of seedlings to infection with parasitic fungi.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xiv (*1937*), 6, pp. 385–388, 1937.

A brief outline is given of experiments, the results of which showed that the inoculation of diseased flax seed with strains of soil-inhabiting bacteria capable of lysing species of *Fusarium* and *Colletotrichum* [*R.A.M.*, xvi, p. 204] considerably decreased the number of diseased seedlings grown under laboratory conditions from the seed of one of the varieties tested (No. 364) but had no effect on the other (No. 609). Certain other strains, however, had a different effect, causing the death of all seedlings of 364 but reducing disease in those of 609, while a third group reduced the number of diseased seedlings of both varieties. Treatment with *Bacillus* [*Pseudomonas*] *fluorescens* and *B. mesentericus* reduced disease in 364 but had no appreciable effect in 609, *B. megaterium* [ibid., xv, p. 395] reduced disease in both varieties, while *B. mycoides* as a rule increased disease. The authors conclude that it is possible by bacterization to reduce very considerably the number of diseased seedlings.

ROST (H.). **Die Pasmo-Krankheit des Leins in Europa. [Erreger: Septoria linicola (Speg.) Garassini.]** [The 'pasmo' disease of Flax in Europe caused by *Septoria linicola* (Speg.) Garassini.]—*Angew. Bot.*, xix, 2, pp. 163–171, 3 figs., 1937.

The 'pasmo' [spasm] disease of flax caused by *Septoria* (*Phlyctaena*) *linicola* [*R.A.M.*, xv, p. 441] was observed for the first time in Europe in 1936, when it was responsible for heavy damage in Yugoslavia. In inoculation experiments at the Biological Institute, Berlin-Dahlem, with material of the fungus from the Banat, flax seed sown in infested soil was largely destroyed. The organism is a typical *Septoria*, with black, ostiolate pycnidia, 65 to 128 μ in diameter in nature and up to 500 μ in culture, and hyaline (crimson with an ochraceous tinge in the mass), elongated, cylindrical, straight or irregularly curved, mostly triseptate pycnospores, 21·7 to 2·8 μ. Good growth is made on potato juice agar at 5° to 31° C., with an optimum at 20°. The most conspicuous feature of the disease is a brown spotting, sometimes commencing at the cotyledonary stage and involving the leaves, stems, sepals, and ovaries. Control should be based on field sanitation, crop

rotation, and the use of healthy seed, disinfection of the seed by fungicidal dusts having proved ineffectual.

HÜBNER (H. J.). **Kampf dem Vermehrungspilz!** [Control the propagation fungus!]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 19, p. 211, 1937.

Having observed that *Pythium de Baryanum*, *Moniliopsis aderholdi*, and other 'propagation fungi' are particularly rife in soils containing a high proportion of humus, the writer uses pure sand for the uppermost layers of his seed-beds [see above, p. 659], while disinfection of the peat-sand mixture commonly used for cuttings has been found advisable, since peat is by no means invariably free from fungi; the sterility of sand and its deficiency in nutrient substances exclude all possibility of fungal development. During the rotting process compost heaps are liable to invasion, not only by beneficial but also by noxious microorganisms, the spread of which should be checked by repeated turning-over of the soil with an admixture of caustic lime.

BURKHOLDER (W. H.). **A bacterial blight of Iris.**—*Phytopathology*, xxvii, 5, pp. 613–621, 1 fig., 1937.

This is an expanded account of the bacterial leaf blight (*Bacterium tardicrescens*) of *Iris germanica*, *I. florentina*, and *I. fulva*, observed in 1934–5 at Ithaca, New York, a preliminary note on which has already been published [*R.A.M.*, xvi, p. 463]. On beef extract-peptone agar cultures the organism measures 1·58 by 0·68 μ and forms circular, entire, mustard-yellow colonies. Brom-cresol purple milk is slowly alkalized and ultimately cleared. Gelatine is not liquefied. Nitrates are reduced to nitrites. Ammonia and a trace of hydrogen sulphide is produced, but no indol. Levulose, galactose, arabinose, xylose, rhamnose, and the sodium salts of citric, malic, and succinic acids are fermented, but starch is not hydrolysed. Inoculation experiments with the organism on plants in the greenhouse were successful provided the leaf was injured and the inoculated plants were kept in a humid atmosphere. Attempts to infect iris rhizomes, various plants related to the iris, and the hosts of the allied pathogens gave uniformly negative results.

KOTTHOFF (P.). **Verticillium coccorum (Petch) Westerdijk als Parasit auf Puccinia chrysanthemi Roze.** [*Verticillium coccorum* (Petch) Westerdijk as a parasite on *Puccinia chrysanthemi* Roze.]—*Angew. Bot.*, xix, 2, pp. 127–130, 2 figs., 1937.

Attention is drawn to the parasitization of *Puccinia chrysanthemi* on Golden Seal chrysanthemums [*R.A.M.*, xv, p. 583] in a Westphalian nursery by *Verticillium* (*Cephalosporium*) *coccorum* [ibid., v, p. 97]. The profuse verticillate branching of the fungus in old cultures of the fungus led to its transference by Miss Westerdijk from *Cephalosporium* to *Verticillium*, other species of both of which genera have recently been found attacking cereal rusts in Germany [ibid., xvi, p. 237]. *P. chrysanthemi* was successfully inoculated with the *Verticillium* in the laboratory, but considerable difficulties were presented by the operation in outdoor stands. The parasite penetrates the leaf tissues through the rust pustules, causing a dark brown discoloration and necrosis round the

site of infection, but is not pathogenic to healthy foliage. *V. coccorum* made profuse growth on coccids on apple twigs, and on *Aspidiotus hederae* on *Asparagus plumosus*.

KUNKEL (L. O.). **Effect of heat on ability of Cicadula sexnotata (Fall.) to transmit Aster yellows.**—*Amer. J. Bot.*, xxiv, 5, pp. 316–327, 2 figs., 1 graph, 1937.

Viruliferous colonies of *Cicadula sexnotata* exposed to temperatures of approximately 31° or 32° C. for one to eleven days temporarily lost their ability to transmit aster (*Callistephus chinensis*) yellows [*R.A.M.*, xvi, p. 622] but regained it after periods ranging from a few hours to many days, while colonies exposed to the same temperatures for twelve days or more became permanently unable to transmit the disease. The period required to regain transmissive ability increased with the period of exposure to heat. The colonies in which the virus was undergoing natural incubation were more adversely affected by the heat treatment than colonies already infective at the time of treatment.

Prolonged heat treatments apparently inactivate all the virus carried by infective insects, short exposures causing inactivation of part of the virus only. The time required for a resumption of infectivity appears to be a heat-induced incubation period, during which the uninactivated portion of the virus multiplies sufficiently to restore infectivity. The unusually long incubation periods in plants exposed to insects that have recently recovered their ability to transmit the virus suggests that these insects carry less virus than those long infective. The isolation of mild strains of the virus by the heat treatment [loc. cit.] indicates that heat exerts a selective action on the viruses of mild strains. Three such strains were shown to remain unchanged on further transmission. The mild strains manifested varying degrees of mildness and differed from typical yellows in causing less severe chlorosis, slight erectness in growth habit, little stunting or distortion, and less branching of secondary shoots. The rate of spread of the disease under field conditions was greatest late in the season when, however, the plants were relatively resistant because approaching maturity, and when the insects were less numerous than at midsummer. The experimental data obtained suggest that midsummer temperatures may inactivate much of the virus carried by the leafhoppers, temperature effect being responsible for the late seasonal rise in rate of spread. [In an abstract in *J. Bact.*, xxxiv, 1, p. 132, 1937, the author records the isolation of 12 mild strains by heat treatment of the vector.]

GREEN (D. E.). **Antirrhinum rust. III. Rust-resistant strains of Antirrhinums.**—*J. R. hort. Soc.*, lxii, 5, pp. 214–219, 1937.

Continuing his investigations at the Royal Horticultural Society's Garden, Wisley, Surrey on the control of *Antirrhinum* [*majus*] rust (*Puccinia antirrhini*) [*R.A.M.*, xv, p. 442; xvi, p. 387], the writer in 1936 tested the possibilities of combating the disease by the use of resistant strains—some raised at the Garden from American seed and others procured direct from the United States. All the former, which differed widely in growth habit, flower colour, and the like, displayed a high degree of resistance (61 to 100 per cent., the latter figure being

recorded for two stocks, Nos. 3 and 12), while only one of the American strains was highly susceptible and seven were entirely rust-free. The degree of resistance in 12 ordinary stocks included in the test for comparative purposes ranged from 0 to 62 per cent.

Palm (B. T.). **Puccinia antirrhini Diet. et Holw. på Öland.** [*Puccinia antirrhini* Diet. & Holw. on Öland.]—*Svensk bot. Tidskr.*, xxxi, 2, pp. 288–289, 1937. [English summary.]

Snapdragon [*Antirrhinum majus*] plants raised from seed on the island of Öland, Sweden, were found in August, 1935, to be infected by rust (*Puccinia antirrhini*) [see preceding abstract], a new record for the country. Although there is a remote possibility that the spores of the rust may have been conveyed by air currents from the nearest site of infection, presumably Denmark [*R.A.M.*, xiv, p. 239], it is considered more likely that the seed itself constituted the source of contamination.

Kammerer (F.). **Einfaches Mittel gegen Hortensienmehltau.** [A simple remedy for Hydrangea mildew.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 20, p. 224, 1 fig., 1937.

Perfect control of hydrangea mildew [*Microsphaera polonica*: *R.A.M.*, xiv, p. 426] in Dresden nurseries is stated to be obtainable by sulphur fumigation, the sulphur being applied in dust form to all the greenhouse hot-water pipes.

Keay (Margaret A.). **An undescribed species of Sclerotinia.**—*J. Bot., Lond.*, lxxv, 893, pp. 130–132, 1937.

In November, 1933, a species of *Sclerotinia* was isolated by F. T. Brooks from diseased *Gypsophila elegans* plants grown commercially in Bedfordshire and showing a rot of many leaves and stems near the ground. Experimental evidence demonstrated that the fungus was strongly pathogenic to *G. elegans*, *Lychnis alba*, *Silene gallica*, *S. maritima*, *Spergula arvensis*, and *Stellaria media*, and weakly parasitic to lettuce, young peas, broad beans (*Vicia faba*), and chicory.

In culture the fungus forms a fluffy white mycelium which becomes slightly buff with age; often a black plectenchymatous tissue develops, from 1 to 3 mm. in thickness, and may bear extremely warty sclerotia on its surface. On 5 per cent. malt extract agar the minimum, maximum, and optimum growth temperatures were, respectively, 0°, 25°, and 20° C. On Dox's agar the sclerotia gave rise to apothecial stipes, the tips of some of which became swollen and urceolate when exposed to light, and the inner and outer surfaces were covered with globose, hyaline microconidia 2·8 to 5 μ in diameter; microconidia also developed on all the media used. A few of the urceolate tips formed disk-shaped apothecia with asci and these structures were also obtained by burying sclerotia in damp sand.

The fungus was characterized by cylindrical to cylindroclavate asci, 155 to 270 (average 194) by 11 to 22 (16·4) μ, unthickened at the top, the tip not stained blue with iodine, protruding slightly beyond the paraphyses at maturity, and containing 8 irregularly uniseriate, hyaline, irregularly oval ascospores, with one end slightly more pointed than the other, measuring 14 to 26·6 (average 20·65) by 6·8 to 17·2

(10·12) μ. The clavate paraphyses were 4 to 5 μ broad. The black, warty sclerotia measured 2 to 10 by 2 to 5 mm.

The fungus differed conspicuously from *S. sclerotiorum*, *S. trifoliorum*, and *S. minor* in pathogenicity and also in cultural characters and the size of the sclerotia. It is regarded as a new species of *Sclerotinia* and is named *S. serica* [with a Latin diagnosis].

Köhler (E.). **Weitere Untersuchungen über das Virus der Lupinenbräune.** [Further studies on the Lupin browning virus.]—*Z. PflKrankh.*, xlvii, 2, pp. 87–97, 7 figs., 1937.

The author presents further experimental evidence in confirmation of his earlier observations as to the identity of the lupin 'browning' virus [*R.A.M.*, xv, p. 510] with Ainsworth's yellow mottle mosaic of cucumber (Johnson's cucumber virus 1) [ibid., xv, p. 102] and spinach mosaic [ibid., xiv, p. 671]. The virus is not only very prevalent annually on lupins at the Berlin-Dahlem Experiment Station but has also been isolated from mosaic cucumber and tobacco plants. The weaker variant of the virus obtained from the latter host acquires renewed virulence by passage through cucumber. Negative results having been given by transmission experiments with the lupin browning virus to peas and other Leguminosae, its identity with 'sore shin' may be regarded as problematical. Inoculation tests on young mangolds gave weakly positive results.

McLarty (H. R.), Wilcox (J. C.), & Woodbridge (C. G.). **A yellowing of Alfalfa due to boron deficiency.**—*Sci. Agric.*, xvii, 8, pp. 515–517, 1937. [French summary.]

Lucerne in the interior of British Columbia commonly shows a light green or yellowish discoloration [*R.A.M.*, xvi, p. 589] evenly distributed over the intercostal area of the leaves, or taking the form of streaks parallel to the veins if the leaf becomes affected only when fully developed. In severe cases the yellowing may affect the growing points, the new leaves being quite yellow, dwarfed, and showing practically no growth at the tip. Many of the leaves turn bronze or reddish, and some show both yellowing and bronzing. As a rule the midrib and veins remain green, and the discoloration becomes less conspicuous as it spreads towards the base. The edge of an affected leaf often turns whitish, and the marginal tissue dies, shrivels, and curls upward. The first growth in spring or after cutting is generally normal, and as a rule the upper leaves turn yellow only when well formed and the lower ones after the upper ones. The internodes are shortened and the plants stunted and squat.

Boric acid and borax were scattered on 7th and 25th March, 1936, at rates ranging from 2 oz. to 4 lb. per tree, round the base of apple trees in an orchard where affected lucerne had been grown as a cover crop for some years. On each occasion the 2 oz. application slightly improved the colour and growth of the lucerne, the 4 oz. application markedly improved them, and the best result was given by the 8 oz. application; burning, however, was caused by all applications of 4 oz. or over, injury progressively increasing with increase in dosage. The lucerne outside the areas treated remained sickly. Chemical analysis showed the boron

content of the yellowed plants to be consistently lower than that of green ones.

Bennett (F. T.). **Dollar spot disease of turf and its causal organism Sclerotinia homoeocarpa n. sp.**—*Ann. appl. Biol.*, xxiv, 2, pp. 236–257, 3 pl., 4 figs., 1937.

Dollar spot, attributed formerly to *Rhizoctonia monteithianum* [*R.A.M.*, xiv, p. 449], has been found to be distributed throughout Great Britain, though it is not nearly so frequent as *Fusarium* patch [*Calonectria graminicola*: ibid., xvi, p. 468] while brown patch (*Corticium vagum*) [*C. solani*: loc. cit.] is apparently rare. Dollar spot occurs most frequently during the mild, wet early autumn following fewer spots in the dry late summer. The spots are circular, about 2 in. in diameter, and coalesce to form large irregular patches, brown at first but becoming of bleached straw colour.

Isolations yielded a fungus with well-developed white, woolly, aerial mycelium, the undergrowth turning cinnamon in from four to six weeks, and subsequently reddish-brown. Olivaceous to black sclerotia form beneath or at the edge of the reddish-brown mycelium; they are of parchment-like thickness and increase in size from small flakes until eventually covering much of the surface. Sporophores appear when the cultures are about two months old, arising either from the edge of the flake sclerotia as minute, bulbous structures with short necks, or more commonly from the large sclerotial masses, the necks protruding as black bristles or blunt projections. Within two or three months the sporophores elongate to pale cinnamon stalks, 4 to 10 mm. long, with blunt, dark apices. Eventually the sporophores become conidiophores, ascophores, or remain sterile. Conidiophores are formed by the blackish apex swelling to a knob-like structure which opens to form a cup about 0·5 mm. in diameter with a broken or irregular, dark-coloured rim, bearing conidia singly at the tips of hyphae lining the inner surface of the cup. The conidia are hyaline, oblong, bicellular, constricted at the septum, narrowed towards the base, with a rounded or bluntly pointed apex, 15·6 to 20·8 by 4·5 to 5·2 μ. Ascophores are freely developed on oat and wheat grains in moist Petri dishes (after 9 and 15 months, respectively). The apothecium may resemble the conidiophore in general appearance, or may develop disk or funnel forms, 1 to 1·5 mm. across. The asci are cylindro-clavate, 140 to 170 by 10·4 to 11·5 μ, and the hyaline, oblong-elliptical, unicellular ascospores, 16 to 17 by 5·2 to 6·5 μ. Paraphyses are sparse. Another strain developed the ascigerous stage but not the conidial, but formed minute cream-coloured pustules of spherical microconidia (1·5 to 2·0 μ in diameter) on cereal grains. Two other British isolations were non-sporing, as were also Monteith's strain received from the United States (*Rhizoctonia* sp.) [ibid., v, p. 742] and Simmonds's strain [*R.* sp.: ibid., xv, p. 445] from Queensland. All these strains are regarded as belonging to the same fungus, which is considered to be a new species of *Sclerotinia* and is named *S. homoeocarpa* with a Latin diagnosis.

The optimum temperature for growth of the British strains is 20° to 25° C. and the minimum 0° to 1°. The American strain has an optimum of about 30° and neither the American nor Australian strain grows at

0° to 1°; all strains have a maximum of 35° to 37°. The British strain is regarded as better adapted to cool conditions than the American.

HOAGLAND (D. R.), CHANDLER (W. H.), & STOUT (P. R.). **Little-leaf or rosette of fruit trees. VI. Further experiments bearing on the cause of the disease.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 210–212, 1937.

In continued experiments on little leaf of fruit trees [*R.A.M.*, xvi, p. 259], using soil from the same diseased peach orchard as formerly [ibid., xv, p. 730 and next abstract], 'white bud' was again induced on maize, and was prevented by the application of zinc sulphate, but not by sheep, chicken, or cow manure low in zinc. Soil sterilization in an autoclave prevented the appearance of the disease in maize, as did soil treatments with formaldehyde and ether. When a small amount (1 or 2 per cent.) of unsterilized soil was mixed with the sterilized the disease reappeared and was again overcome by the addition of zinc sulphate. When apricot seedlings and maize plants were grown in tanks containing the little leaf soil between lucerne plants that had been established about a year, the growth of the apricot and maize plants was retarded as compared with that in soil treated with zinc sulphate, but practically no little leaf or white bud symptoms developed, though the apricot and maize plants in the control tank were markedly affected. The lucerne showed no sign of the disease, indicating that it absorbs adequate amounts of zinc from the soil used in the test. When two successive maize crops were grown in soil treated with heavy applications of urea no disease appeared. In another test, when the roots of a tomato crop were allowed to decompose in the soil, the second crop of maize following the tomato crop showed no symptoms. Light and temperature greatly influence the effects on plants of this soil or of solutions deficient in zinc. Analyses indicated that typically diseased plants are almost always relatively low in zinc.

The data obtained in two years' work suggest that zinc deficiency is the immediate cause of little leaf and related diseases, though in some cases zinc deficiency in the plant may result from the activities of soil micro-organisms. The possibility that direct toxic effects may also be present in severe forms of the disease is not excluded.

ARK (P. A.). **Little-leaf or rosette of fruit trees. VII. Soil microflora and little-leaf or rosette disease.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 216–221, 7 figs., 1937.

In a two years' detailed study of the microflora of soils bearing normal and little leaf plants using Cholodny's slide and the dilution plate methods [*R.A.M.*, xv, p. 334], it was found that little leaf soils incubated under partly anaerobic conditions became very toxic to maize, tomato, cotton, and peach, though the toxicity was destroyed by steam sterilization [see preceding abstract]. When little leaf soil was inoculated into quartz sand cultures and maize seedlings were planted, the zinc content of the culture solution being low, the plants in the sand culture with non-sterilized soil developed white bud, while others in the sand plus sterilized soil and sand with no soil remained normal for six weeks.

Three species of bacteria, referred to as Chr, D 16, and 2722, were very numerous and appeared somewhat consistently in platings of soil samples from the root zone of diseased plants. Maize seeds sown in little leaf soil treated separately with D 16, 2722, and a mixture of both, germinated very slowly as compared with the controls in sterilized soil, and were stunted and chlorotic. The cultures D 16, 2722, and a mixture of both, when inoculated into a complete culture solution containing 0·023 p.p.m. of zinc, produced symptoms of white bud in maize seedlings, the condition being consistently corrected by increasing the amount of zinc to 0·046 p.p.m. or injecting zinc sulphate into the stems.

In preliminary tests with peach seedlings grown in sand culture and walnuts in little leaf soil, each series was inoculated with 2722, and developed symptoms resembling those of little leaf in the field; the presence of zinc prevented the appearance of such symptoms.

PERLBERGER (J.). **Rhizoctonia bataticola (Taub.) Butler in deciduous fruit nurseries in Palestine.**—*Palest. J. Bot. hort. Sci.*, i, 3, pp. 37–51, 2 pl., 1937. [Hebrew abstract.]

All varieties of deciduous fruit trees grown in Palestine nurseries, including apple, pear, quince, apricot, peach, almond, plum, myrobolan [*Prunus divaricata*], cherry, and walnut (*Juglans nigra*), are liable to infection by *Rhizoctonia bataticola* group B [*R.A.M.*, ix, p. 685], a culture belonging to group A (*R. lamellifera*) [ibid., xiv, p. 233] being obtained on one occasion only, from Douçain apple. The disease is of much economic importance, sometimes destroying up to 60 per cent. of the young trees.

Infection occurs chiefly during summer, the first symptom being a sudden wilting and blight of the leaves, which, however, do not fall for several weeks. The fungus attacks the young nursery stock at the root crown, causing in many cases the formation of a blackish-brown girdle, 2 to 3 mm. above or below the ground. The infected girdle is marked off from the lower part of the main root by a smooth line, but there is no clear line of demarcation between the diseased and healthy parts of the stem on the upper boundary. The browning usually spreads upwards until all the upper part of the tree has wilted. The main root below the black line in the wood and the brown ring may produce new roots and sprouts, but as a rule the rot attacks the entire root system, the secondary roots, and the root hairs.

Out of 231 cultures made from affected trees 78 gave *R. bataticola* only, 30 *R. bataticola* in association with another fungus, and the rest were negative. This is the first record of *R. bataticola* on young deciduous fruit trees; it was not found on mature trees. Inoculation experiments have not yet been carried out.

The epidemic summer mortality due to the disease is largely confined to the coastal parts of Palestine, where the cultural methods differ from those used in the hills. Most of the young trees are introduced from France and northern Italy and become weakened by new and unfavourable climatic conditions, the root collar in the upper layer of the soil being liable to suffer damage from the heated soil. It was further observed that budding operations rendered the trees susceptible to infection. Preliminary tests indicated that infection may be prevented

by budding in autumn instead of summer, after two applications to the stems of 3 or 4 per cent. Bordeaux mixture.

KÜTHE (K.). **Zur natürlichen und künstlichen Infektion des Apfelschorfes, Venturia inaequalis (Cooke) Aderhold, und seiner Bekämpfung.** [On natural and artificial scab infection of Apple, *Venturia inaequalis* (Cooke) Aderhold, and its control.]—*Z. Pfl-Krankh.*, xlvii, 4, pp. 193–211, 2 figs., 3 graphs, 1937.

From his recent studies at the Landsberg (Warthe) Agricultural Experiment Station on the natural and artificial infection of apples by scab (*Venturia inaequalis*) [*R.A.M.*, xvi, p. 618 and next abstract] the author concludes that a correct timing of the pre-blossom spray application is essential to ensure the full efficacy of the treatment; the application should be made as late as possible before ascospore ejection, the later sprayings being much less important. Spray schedules should be modified so as to take into consideration the fact that new infections occur very largely in August. In view of the local variation in the time of spore discharge, observation stations should be established over the whole of Germany to determine the local spraying schedules. Preparations for use against scab can be usefully subjected to preliminary tests on young trees artificially infected and grown in the greenhouse. From his inoculation experiments he concludes that a monospore culture can infect several apple varieties, some more readily than others, while each variety can be attacked by several strains of the fungus. Reisolations from successful infections with a monospore strain on different varieties showed no deviation from the original culture on apple juice agar or yeast extract.

KEITT (G. W.) & PALMITER (D. H.). **Heterothallism in Venturia inaequalis.**—*Science*, N.S., lxxxv, 2212, p. 498, 1937.

In October, 1935, potted Fameuse apple trees forced in the greenhouse were inoculated with conidia from cultures obtained by isolating each of the eight spores of an ascus of *Venturia inaequalis* [see preceding abstract]. The conidia from each isolate were used singly and mixed in every possible combination of two. Infection resulted from all the inoculations, while uninoculated trees remained free from scab. The microscopic examination of overwintered leaves revealed no perithecia on the uninoculated material or on that inoculated with conidia from any single isolate of the fungus. The results of the two-isolate inoculations showed that the eight isolates fell into two groups of four each, all the 16 possible combinations between which yielded fertile perithecia. None of the eight combinations in which conidia from one isolate were mixed with those from another within the same group produced fertile perithecia, except in three instances believed to have been due to contamination. Cleared-leaf studies showed that perithecial rudiments were formed in profusion following inoculation by single isolates or sterile mixtures, but usually attained less than one-half the diameter of the normal mature perithecium. From these preliminary experiments *V. inaequalis* would appear to be heterothallic, each isolate being hermaphroditic and self-sterile.

WINKELMANN (A.), HOLZ (W.), & JAENICHEN (H.). **Beiträge zur Biologie und Bekämpfung des Apfelschorfes (Fusicladium dendriticum [Wallr.] Fckl.). III. Mitteilung.** [Contributions to the biology and control of Apple scab (*Fusicladium dendriticum* [Wallr.] Fckl.). Note III.]—*Zbl. Bakt.*, Abt. 2, xcvi, 9–12, pp. 177–191, 3 graphs, 1937.

The results of the writers' continued studies on the life-history and control of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*: *R.A.M.*, xv, p. 661 and preceding abstracts] in 1936 confirmed those of 1935. Both in the dry climate of Zossen and under the very humid conditions prevailing in the Lower Elbe fruit-growing district the perithecia of the fungus were mature by the end of March, the first ascospores being found in the air from the first three days of April to the beginning of June in the former, and from the 30th March to 14th May in the latter region. The development of the perithecia in foliage from the Lower Elbe water trenches was retarded by about a fortnight in comparison with that of the same organs from leaves in pots.

The application of nitrogenous salts to potted seedlings appeared to enhance susceptibility to scab, an observation confirmed by infiltration experiments in which Winter Golden Pearmain leaves were immersed in M/20 solutions of various substances, carefully evacuated, then inoculated, and held in a damp chamber for 14 days. Potash salts, on the other hand, tended to reduce the incidence of infection in pot tests. In inoculation tests with ascospores on one-year-old grafts higher infection percentages were obtained on a given variety with inoculum from the same than from another sort, but in the case of conidia the differences were less apparent.

In the Berlin district scab has so far been found attacking the branches of only one apple variety (Virginian Rose), on which conidia were produced on 22nd February, 1935, but in the Lower Elbe valley viable conidia were released on 3rd March from ruptured lesions on the branches of six varieties, including Beauty of Boskoop and Bismarck. This constitutes a factor of importance in the control of the disease [ibid., xvi, p. 470] and spraying must be initiated earlier where such infection occurs. At Zossen the postponement of fungicidal treatment owing to rain largely obviated its beneficial effects, which were fully experienced, however, in the Lower Elbe valley whenever the first application was made during or shortly after the initial ascospore discharge.

BAILEY (J. S.) & THIES (W. H.). **Some observations on internal cork disease of Apples in Massachusetts.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 187–191, 1 fig., 1937.

In 1936, McIntosh and Cortland apple trees in at least twelve orchards in different parts of Massachusetts showed internal cork [*R.A.M.*, xvi, p. 470 and next abstracts], accompanied in the latter variety by a roughness of the surface. Observations made in seven widely separated orchards showed that the disease is not confined to any particular type of soil, but that it occurs wherever the subsoil is unfavourable to root penetration and is to some extent prevented by heavy mulching. Trees

in such soil would be unfavourably situated in time of drought and this association of the disease with water deficiency has already been reported by other workers. No data of the effect of boron on the disease are available for Massachusetts.

BURRELL (A. B.). **Boron treatment for a physiogenic Apple disease.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 199–205, 1937.

Studies conducted over a period of eleven years on the incidence of drought spot [*R.A.M.*, xvi, p. 589], internal cork, die-back, and rosette of apples in New York [ibid., xiv, p. 592 and preceding and next abstracts] showed that when the fruit symptoms appear within six weeks of petal-fall they are fairly constant for any given variety. Tolman Sweet is consistently free from drought spot and internal cork, but it very occasionally shows rosette and die-back. The usual symptom on McIntosh, Northwestern Greening, Rome Beauty, Northern Spy, Winter Banana, Baldwin, Cortland, and Lobo is drought spot, and on Fameuse, Rhode Island Greening, Duchess of Oldenburg, and Wealthy, internal cork. Northern Spy and Duchess of Oldenburg often show both cork and drought spot or a combination of them, and this sometimes applies to the other varieties. When the fruit symptoms appear at or after midsummer they usually take the form of internal cork in all varieties, and this symptom appears to be geographically more widespread than the others. Affected fruits may drop at any time during the season. Circumstantial evidence is given which strongly suggests that drought spot, internal cork, incipient die-back, die-back, and rosette are (under the conditions prevailing in New York) symptoms of a single disease.

Experiments are described on the treatment of the disease by boric acid injections, but these have already been noticed from another source [ibid., xvi, p. 471].

MCLARTY (H. R.), WILCOX (J. C.), & WOODBRIDGE (C. G.). **The control of drought spot and corky core of the Apple in British Columbia.**—*Bett. Fruit*, xxxi, 10, pp. 12–13, 1937.

The authors describe the symptoms of drought spot, corky core, rosette, and die-back disorders which have affected apple trees in British Columbia for some years [see preceding abstract]. The history of the investigations on the disease are briefly traced but not until 1934 was the discovery made that the disease is curable by feeding with boron [*R.A.M.*, xvi, p. 42]. The treatment was recommended to growers in 1935 and was uniformly successful. Tests in 1936 confirmed the earlier results in so far as concerned the injection method; spraying gave excellent control but caused some injury to the foliage. Soil applications of boric acid and borax gave perfect control of drought spot and corky core with no ill effects so far. None of the Okanagan Valley soils tested was high in boron, and it was also found that the smaller the boron content of McIntosh apple leaves, fruit, or twigs the more drought spot there was. The authors recommend autumn applications of boric acid evenly to the soil round affected trees and others in proximity to them at the rate of 30 lb. per acre, starting 2 or 3 ft. away from the trunk and continuing to the extreme limit of the limbs. The treatment

is also of benefit in cases of pear and apricot drought spot and plum gum spot [drought spot: ibid., v, p. 537; cf. also xv, p. 34].

ASKEW (H. O.), THOMSON (R. H. K.), & KIDSON (E. B.). **The boron status of New Zealand fruit soils.**—*N.Z. J. Sci. Tech.*, xviii, 11, pp. 789–796, 1937.

The results of analyses of a number of New Zealand soils for boron content are presented. In the top soils the values ranged from 0·15 to 2·20 p.p.m. of boric oxide. In general, the boron content falls with increase in depth of sampling, especially in Nelson soils. Internal cork of apples [see preceding abstracts] develops on soils of low boron content, and is also favoured by an open, free, or shallow soil, especially with underlying gravel or sand.

THOMAS (H. EARL). **Apple mosaic.**—*Hilgardia*, x, 14, pp. 581–587, 3 figs., 1937.

A mosaic disease of apple is recorded on the Ranvier variety at Paradise, California, in 1932, and on a single tree of Smith Cider at Berkeley in 1936, whilst it has also been observed on the Starking variety in California. The disease is probably identical with that known in the eastern United States [*R.A.M.*, xii, p. 636] and possibly in part with the mosaic mottling noted in Washington [ibid., xv, p. 345], but the illustrations accompanying the record from Bulgaria [ibid., xiv, p. 639] are considered by the author as more characteristic of non-infectious chloroses. In addition to the symptoms commonly seen on the apple a complete chlorosis of the larger vein (vein-clearing) is occasionally noticed. The disease was successfully transmitted by grafting to the varieties Golden Delicious, Gravenstein, Lady, Tompkins King, White Pearmain, and Yellow Newtown and also to *Cotoneaster harroviana*, loquat (*Eriobotrya japonica*), *Photinia arbutifolia*, rose, and *Sorbus pallescens*. While the incubation period may be as short as 53 days on the apple, the movement of the virus is slow, especially in *P. arbutifolia* and the rose. One rose plant did not show symptoms on all its branches after 27 months. In the orchard at Paradise, 22 of 53 of Ranvier trees were affected in July, 1935, and no new infections were found in May, 1936, while the disease at Berkeley has not spread to any other trees in the same garden. Heating dormant apple shoots failed to inactivate the virus.

HALLER (M. H.) & LUTZ (J. M.). **Soft scald of Jonathan Apples in relation to respiration.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 173–176, 1 graph, 1937.

When Jonathan apples were held for different periods at 70° F. before being stored at 32° the amount of soft scald [*R.A.M.*, xv, p. 811] that developed at the latter temperature increased to a maximum at 6 to 9 days' delay at 70°, and then decreased. The respiratory rate at 70° increased for a period and later decreased. No relationship was established, however, between the respiratory rate and the maturity of the fruit or between the respiratory rate at 70° at the time of transfer and the amount of soft scald that developed at 32°. These results are opposed to the hypothesis of Harding [ibid., xiv, p. 592] that the

respiratory activity of apples at the time of storage serves as an index of the storage capacity of the fruit, particularly with respect to soggy breakdown (of which soft scald has been regarded as one type) [ibid., xiv, p. 770].

Brien (R. M.). **The fungi associated with mouldy-core of Apples.**—*N.Z. J. Agric.*, liv, 5, pp. 283–286, 1 fig., 1937.

Mouldy core of apples [*R.A.M.*, xiv, p. 591], prevalent for many years in New Zealand, caused serious losses of Delicious apples in the 1934–5 season, leading to this attempt to determine the responsible fungi. At harvesting, external symptoms are confined to slight yellowing near the stem cavity, but later there is premature ripening and fruit fall, with slight bronzing round the crown. Internally, there is a zone of brown decayed tissue round the core, which may involve the whole fruit, and seeds and seed chambers are covered with hyphae.

Over 800 isolations of fungi were made. In fruits affected by mouldy-core alone *Gloeosporium perennans* [ibid., xv, p. 661] was present in 89·8 per cent., *Fusarium lateritium* var. *fructigenum* [*F. lateritium*: ibid., xiv, p. 40], *Septoria* sp., and *Phoma* sp. also being found. In fruits attacked by codling moth [*Cydia pomonella*] in addition to mouldy-core, *G. perennans* was recovered from 45·8 per cent., *F.* sp. (mainly *F. lateritium*, *F. culmorum*, *F. orthoceras*) from 15·5 per cent., *Penicillium* sp. from 10·3 per cent., while *Alternaria tenuis*, *Rhizopus* sp., *Epicoccum granulatum*, and *Pleospora* sp. were also found. Of these fungi, *G. perennans*, *F. lateritium*, *A. tenuis*, *R.* sp. and *P.* sp. are pathogenic to apple in New Zealand [ibid., xiii, p. 523]. Of 1,290 apples examined in 57 orchards, 40·8 per cent. were affected, and 82·8 per cent. showed open calycine sinuses. It is concluded that mouldy-core is caused by fungi entering the fruit through the open calycine sinus [ibid., xiv, p. 591], which constitutes a varietal defect, enhanced in New Zealand by climatic and environmental conditions. Any of the fungi found can gain entrance and produce mouldy-core.

Smock (R. M.). **Bitter pit of Gravenstein Apples. I. The effect of environmental temperature during the growing period.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 179–186, 1 fig., 1 graph, 1937.

Negative results were obtained in an experiment made to ascertain the effect of environmental temperature during the growth of the fruit on bitter pit of apples [*R.A.M.*, xvi, p. 541]. Boron injections were likewise without effect on the disease [ibid., xvi, p. 262].

Hansen (H. N.), Thomas (Harold E.), & Thomas (H. Earl). **The connexion between Dematophora necatrix and Rosellinia necatrix.**—*Hilgardia*, x, 14, pp. 561–564, 1 pl., 1937.

On four portions of apple roots killed by *Dematophora necatrix* [*R.A.M.*, xiv, p. 176] kept in moist chambers in the laboratory for two years, perithecia were found typical of the genus *Rosellinia* and closely agreeing with *R. necatrix* as studied by Viala and Prillieux. These investigators, however, describe the perithecia as lacking ostioles, but a definite pore is present, though not discernible in old perithecia. Furthermore, the dimensions of the spores, 31·1 to 47·6 by 5·1 to 7·1 μ

(average 37·1 by 6·3 μ), are slightly but not significantly different from those given by Viala and Prillieux. Attempts to germinate the conidia of the fungus were unsuccessful, but 3 per cent. germination of the ascospores was effected by suspending them in 2 c.c. of 5 per cent. lactic acid, adding 10 c.c. of water after the lapse of 15 minutes, pouring the suspension over the surface of potato dextrose agar (3 per cent. agar) in Petri dishes (1 c.c. per dish), and incubating at 22° to 24° C. Single ascospore cultures produced the coremial stage of *D. necatrix* within 24 days, and inoculations with some of these cultures on apple trees successfully reproduced the disease. The genetic relationship of the two stages is therefore established. A species of *Phomopsis* constantly associated with *R. necatrix* is not related to the pathogen.

Shear (J. M.). **Lanolin as a wound dressing for trees.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 286–288, 1937.

The author describes comparative tests on eight Grimes Golden apple trees and an apple tree of unknown origin of the treatment of wounds with lanoline, lanoline-indol acetic acid, and white lead paint. The greatest amount of callus growth was produced on the wounds treated with plain lanoline on which the area of callus tissue after five months was approximately one-fifth more than on the untreated wounds. Most of the beneficial effect was due to the fact that the lanoline prevented the cambium and young callus from drying. Its consistency is such that a film is kept over the growing callus, permitting unimpeded growth. The indol acetic acid was apparently used at too great a concentration (1 to 200) to cause callus stimulation, but with a proper amount of the hormone it should give more growth than plain lanoline.

Overholser (E. L.) & Clore (W. J.). **Six years' records of amount of cork spot fruit on individual d'Anjou Pear trees.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 192–198, 1937.

Six years' observations on the incidence of cork spot on d'Anjou pears in central Washington [*R.A.M.*, xvi, p. 471] showed that serious losses have been caused to pears on *Pyrus serotina* stocks, but that the disease is much less prevalent on pears grown on *P. communis* stocks. Between 1931 and 1936, inclusive, in one orchard studied cork spot was most prevalent in 1931, when the average number of fruits per tree was the second lowest for the period, and least prevalent in 1933, when the average number of fruits per tree was the highest for the period. Individual trees may tend to produce a relatively low or relatively high percentage of corked fruits each year. In comparing the highest and lowest yields of individual trees in relation to cork spot, it was found that when the crop was largest the percentage of cork spot was lower than when the smallest crop was borne, but the lowest crop year did not always coincide with the highest percentage of cork spot. Incidence was higher in the year when the trees made the greatest increase in trunk circumference and produced the largest individual leaves than when the trees made the least increase in girth and in the size of individual leaves. In a fertilizer experiment the trees in nitrogen plots making an annual increase in trunk circumference of 4·5 cm. had an average annual incidence of cork spot of 45 per cent., as against only 24 per cent. for

trees in plots given phosphorus and potassium which had had an average annual increase in trunk circumference of only 3 cm.

WOLLENWEBER (H. W.). **Der schwarze Rindenbrand der Quitte. [Erreger: Phacidiella discolor (Mout. et Sacc.) Potebnia.]** [The black cortical blight of the Quince caused by *Phacidiella discolor* (Mout. et Sacc.) Potebnia.]—*Angew. Bot.*, xix, 2, pp. 131–140, 2 figs., 1937.

Phacidiella discolor, the agent of a black cortical blight of pome fruits [*R.A.M.*, xiv, p. 42], the ascogenous stage of which has hitherto been recorded only on *Pyrus* spp. in the Ukraine and Great Britain, was observed in 1936 on necrotic quince branches at the Biological Institute, Berlin-Dahlem. The spermogonial phase of the fungus, previously known only on *P.* spp. under the names of *Phacidiopycnis malorum*, *Pyrenochaeta furfuracea*, and *Fuckelia conspicua* [ibid., vii, p. 585], was also detected on living and necrotic branches and decayed fruits of quince and apple, and on pears, the latter being invaded mostly through the stem-end.

Pure cultures from the non-septate, ovoid to ellipsoid, hyaline ascospores (averaging 21 by 10 μ) of *Phacidiella discolor* from quince first gave rise to an ephemeral conidial stage with rod-shaped or cylindrical, continuous, hyaline conidia (6·8 by 1·9 μ, 7·5 by 2·5 μ on germination), rarely uniseptate (18 by 4·6 μ), and subsequently to normal *Fuckelia* spermogonia with continuous macro- and micropycnospores (11 by 8 and 5·1 by 2 μ, respectively). A revised Latin diagnosis of the fungus is given, with synonymy.

Both the ascogenous stage of *P. discolor* from quince and the imperfect phase from quince and apple were shown by inoculation experiments to be capable of inducing a black rot of both fruits. The economic significance of the disease, however, does not appear to be considerable.

PROEBSTING (E. L.). **'Kelsey spot' of Plums in California.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 272–274, 1 fig., 1937.

In 1935, plums in the interior valleys of California were widely affected by the high temperature affection known as Kelsey spot [*R.A.M.*, xvi, p. 473]. The condition appeared soon after a hot spell when the fruit was nearly ready for picking. Summer-pruned trees appeared to show less damage than those left unpruned, and no affected fruits were found in another orchard where orchard grass [*Dactylis glomerata*] was growing vigorously. Exposure of the fruit in ovens to 107° F. for 5 hours resulted in no injury, for 15 hours in 10 per cent. damage, and for 72 hours in 60 per cent. These observations confirm Dippenaar's findings and support the view that the trouble is due to heat rather than to drought, 105° F. being about the critical temperature. The evidence indicated that damage due to the condition can be very considerably reduced by summer cover crops.

ADAM (D. B.). **Silver leaf diseases in orchard trees.**—*J. Dep. Agric. S. Aust.*, xl, 9, pp. 693–695, 1 fig., 1937.

Silver leaf (*Stereum purpureum*) of plum trees is stated to be increasing in prevalence in the Adelaide district of South Australia [*R.A.M.*,

x, p. 670; xii, p. 142], and in this connexion a popular account is given of the symptoms of the disease, supplemented by directions for its control. Apricots, apples, and peaches are also affected but show a considerable degree of resistance. Tree lucerne is also reported to suffer from silver leaf in the Mt. Lofty Ranges district, but in general Australian climatic conditions do not appear to be so favourable to the development of the disease as those obtaining in England.

Schäfer (W.). **Beobachtungen über das Auftreten der Kräuselkrankheit (Taphrina deformans) an Pfirsichen.** [Observations on the occurrence of curl disease (*Taphrina deformans*) on Peaches.]—*Z. PflKrankh.*, xlvii, 3, pp. 187–188, 2 figs., 1937.

In recent experiments in a German nursery, only the branches of five-year-old peach seedlings enclosed in bags shortly before the bursting of the buds remained free from leaf curl (*Taphrina deformans*) [*R.A.M.*, xvi, p. 474], and the author concludes that overwintering spores are at least equally instrumental with the mycelium in the production of fresh spring infections. The malformations caused by the fungus are inconsiderable after the leaves reach a fairly advanced stage of development, and the practical advantage of spraying just before the emergence of the shoots is thereby demonstrated.

Wormald (H.). **Bacteriosis of stone fruit trees in Britain. VI. Field observations on bacteriosis of Sweet Cherry trees.**—*J. Pomol.*, xv, 1, pp. 35–48, 4 pl., 1937.

For many years serious losses have been occasioned in cherry orchards in England by young trees dying off and old-established trees losing large limbs. Various types of damage have been observed, all parts except the roots being affected, the symptoms in sweet cherry including stem, crotch, and branch cankers, shoot wilt, bud and spur blight, leaf spots, and occasionally fruit spots. Many isolations were made from the various lesions, and it is stated that the bacteria fell into two groups, one conforming to *Pseudomonas prunicola* [*R.A.M.*, xv, p. 139], and the other to *P. mors-prunorum* [ibid., xv, p. 816]. Successful inoculation experiments with these bacteria are being described in a later publication. The latter organism is stated to be the more generally distributed in Britain, whilst the former is closely related to, and perhaps indistinguishable from, *P. syringae* [ibid., xvi, p. 329] which occurs on the Continent and in North America. Both organisms have been isolated from lesions on stems, branches, shoots, leaf spots, and fruit spots. Observations in commercial plantations showed that among the most susceptible varieties are Black Tartarian, Cluster Black Heart, Bigarreau de Schrecken, Black Eagle, and Bradbourne Black, while Waterloo, Turk, Amber Heart, and Early Rivers are sometimes seriously attacked. Detailed records at Wye during 1936 on over 350 trees of nine varieties showed that Frogmore was the most resistant to cankering, followed in order by Governor Wood, Rounded Heart, Early Rivers, Napoleon, and Waterloo, the first three being also the most resistant to leaf spotting.

The various symptoms observed in cherry trees have much in common with those on the plum. Cankering of the branches is more

frequent than in plums, in which the dying-back of individual branches is exceptional. Gummosis is a conspicuous feature of the cherry disease. Foliage infection is more serious in cherries than in plums, and may be attended with marginal scorching and complete withering of the leaves. In both cherries and plums the sequence of infection is similar; stem lesions develop during the autumn, winter, and early spring, and leaf and shoot infections in spring and summer; the organisms die off in the summer. Control of the disease is being sought along several lines, such as avoidance of pruning in autumn, winter, and early spring when susceptibility is greatest; excision of infected parts early in the year as soon as the lesions can be detected; spraying the branches and stems in the autumn with Bordeaux mixture, some growers obtaining a measure of success by this means; spraying the foliage against leaf spot, which has given some degree of control (but Bordeaux causes injury to certain varieties); and the use of disease-resistant stocks. The work on bacteriosis of cherry in other countries is briefly summarized.

GRUBB (N. H.). **Bacteriosis of Cherry trees: relative susceptibility of varieties at East Malling.**—*J. Pomol.*, xv, 1, pp. 25–34, 1937.

From observations made at East Malling on the susceptibility of 179 varieties of cherries to bacterial canker [*Pseudomonas mors-prunorum* and *P. prunicola*: see preceding abstract] a list is given of the varieties classified in four groups, Lambert, Large and Small Black Mazzard, Royal Duke, Morello, and 35 others being very slightly susceptible, Black Tartarian E, Early Rivers, Archduke, Morello A, and 29 others rather more so, and others considerably or extremely susceptible. Varieties differ in their relative susceptibility to the various types of infection associated with this disease. Root-stocks do not appear to influence the susceptibility of the scion directly (though they may indirectly), and susceptible scions on resistant stocks may be killed while the stock remains uninjured. Local conditions or age of the trees are thought to be responsible for exceptional reactions observed in varieties growing in other orchards.

PASSAVALLI (L. P.). **Difesa preventiva e curativa della Fragola da malattie e insetti nocivi.** [Preventive and curative defence of the Strawberry against diseases and pests.]—*Boll. Soc. tosc. Ortic.*, lxii, 3–4, pp. 55–60, 2 figs., 1937.

Popular notes are given on the occurrence and control in Italy of the following strawberry diseases. *Peronospora potentillae* causes a reddish-brown spotting of the foliage, on the underside of which may be microscopically detected the dichotomously branching conidiophores of the fungus bearing pale violet conidia. The roots are also reported to be affected. Two applications of 1 per cent. Caffaro powder or Bordeaux mixture are generally sufficient to combat the disease. Other foliar disorders are due to *Septoria fragariae* [*R.A.M.*, xiii, p. 110], *Sphaerotheca humuli* [ibid., xv, p. 704], and *Marssonia* [*Marssonina*] *potentillae* [ibid., xiii, p. 9], while the fruits are liable to infection by *Botrytis cinerea* [ibid., xii, p. 102] and *Phytophthora omnivora* [*P.* (?) *cactorum*: ibid., xii, p. 266]. A serious disorder involving desiccation of the shoots and leaves and swelling of the rootlets is caused by a

Micrococcus, which persists in the soil and is responsible for steadily increasing losses unless the infected plants are promptly destroyed.

MITCHELL (R. S.). **Stem end rot of Bananas with special reference to the physiological relationships of Thielaviopsis paradoxa (De Seynes) Von Höhn.**—*J. Coun. sci. industr. Res. Aust.*, x, 2, pp. 123–130, 2 pl. (after p. 168), 1 graph, 1937.

In this study of *Thielaviopsis* [*Ceratostomella*] *paradoxa* isolated from banana stem-end rot [*R.A.M.*, xiv, p. 517; xv, p. 104] in Queensland, the author states that this strain of the fungus (with exospores on the natural substratum measuring 10 to 32 by 5 to 13 μ, and endospores 9 to 23 by 3 to 6 μ) differs slightly in spore size from those described by other workers on other hosts, though these show a considerable range of variation in this respect.

A number of comparative inoculations on banana, pineapple, and sugar-cane, using the strains derived from these three hosts, showed that while the pineapple and sugar-cane strains behave similarly on these two plants, they are only very weakly pathogenic to banana, while the banana strain can attack pineapple only very weakly and sugar-cane not at all. Passage of the banana strain through pineapple, and vice versa, did not affect pathogenicity. These results support the field evidence, which suggests that infection in banana plantations does not originate in diseased pineapples and sugar-cane. The banana disease occurs in winter, the pineapple disease in summer. Temperature studies showed that the optimum and maximum temperatures for growth of the three isolates are: banana strain 24° to 26° C. and 32° to 34°, respectively; both pineapple and sugar-cane strains, 29° to 30° and 34° to 36°, respectively. The author considers that these differences indicate that the Australian banana strain is a biologically distinct one, and suggests for it the name *T. paradoxa musarum* n. var. [without a Latin diagnosis].

K. **Ueber Bodendämpfung—Wirkung, Nutzen und Nachteile.** [On soil steam-sterilization—effect, uses, and drawbacks.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 21, pp. 233–234, 1937.

After briefly reviewing the uses of soil sterilization by steaming in the control of plant pathogens and outlining the methods employed [cf. *R.A.M.*, xvi, p. 548], the writer points out that the process involves the destruction of numbers of beneficial micro-organisms, only bacteria surviving temperatures up to 200° C., and in order to restore the necessary equilibrium among the population within a reasonable period the treated soil should be enriched by the admixture of small amounts of a good, healthy soil.

DIEFFENBACH (E. M.). **Hose coupling for high-pressure spray lines.**—*Agric. Engng, St Joseph, Mich.*, xviii, 5, p. 214, 1937.

A screw coupling without swivel for use with the short high pressure (¾ in.) spray hose now commonly used in spraying from the top of high pressure portable sprayers has been designed and constructed during investigations of orchard spraying by the United States Bureau of Agricultural Engineering, and technical details are here given of its

attachment and installation. The new device is considered to represent a great improvement over the ordinary coupling, the elimination of the swivel increasing strength and capacity while reducing weight, bulk, and expense.

Taylor (G. G.). **Application of orchard sprays. III. Spray nozzles (continued).**—*N.Z. J. Agric.*, liv, 2, pp. 71–74; 5, pp. 267–274, 1 fig., 10 graphs, 1937.

Continuing his studies [*R.A.M.*, xvi, pp. 197, 396] on the efficiency of spraying apparatus, the author discusses in detail, and illustrates graphically, the effect of variations in pressure and nozzle design (diameter of disk aperture, and diameter, number, and angle of whorl-plate openings) on the depth of penetration and volume delivery. Depth of penetration was measured by means of a 25 ft. pole, close to the base of which nozzles pointing vertically upwards were fixed, the maximum height of the spray being determined under windless conditions, even a light breeze reducing the carry by 50 per cent. Volume delivery was determined by weighing the water delivered from a nozzle directed into a barrel for 1 minute. As a result of his studies the author tentatively recommends the following standards of nozzle type. For spray rods 4 ft. 6 in. to 6 ft. long, double nozzles with whorl-plates $\frac{1}{8}$ in. thick, $1\frac{3}{16}$ in. in diameter, with 6 openings of $\frac{1}{8}$ in. in diameter, centred on a circle of $\frac{5}{8}$ in. in diameter, and drilled at an angle of 45°; whorl chambers approximately $\frac{1}{8}$ in. deep; disks $1\frac{5}{16}$ in. in diameter and approximately $\frac{3}{64}$ in. thick with apertures $\frac{5}{64}$ in. in diameter for summer and from $\frac{4}{64}$ in. for winter use. For large trees the angle of whorl-plate openings may be reduced to 22·5°, and penetration may be still further increased, if necessary, by using a single nozzle with 6 openings of $\frac{10}{64}$ in. in diameter set at an angle of 22·5°, and with a disk aperture up to $\frac{8}{64}$ in. in diameter. Nozzle pressure should be 250 to 300 lb. For most trees a volume delivery of 3 to 3·5 and 2·25 to 2·75 galls. per minute is sufficient for summer and winter spraying, respectively. This may be somewhat reduced for small trees, or increased to 4 to 4·5 galls. per minute for large ones.

For spray guns, it is desirable that there should be suitable adjustments for rapid and continuous change from wide to narrow angle of cone without sudden change at any point in the adjustment. The required disk sizes must be found by trial, the desirable volume delivery being up to 3·5 and 2·5 galls. per minute for summer and winter use, respectively, corresponding in most cases with $\frac{8}{64}$ in. and $\frac{6}{64}$ in. disks. Nozzle pressure should be 300 to 350 lbs.

These standards of volume delivery are rather higher than those usually employed, and may be found to exceed the capacity of existing pumps. In selecting nozzles, therefore, pump capacity should be considered.

Fajans (E.) & Martin (H.). **The incorporation of direct with protective insecticides and fungicides. II. The effects of spray supplements on the retention and tenacity of protective deposits.**—*J. Pomol.*, xv, 1, pp. 1–24, 1937.

In introductory remarks to these further studies [cf. *R.A.M.*, xv,

p. 382] the authors explain that the quantity of spray residue is determined by the initial amount of protectant retained on the foliage (initial retention) and the capacity of the deposit to withstand weathering (tenacity). In addition, uniformity of deposition (coverage) and suchlike factors influence protective efficiency by their effect on the action of solubilizing agencies (availability) and tenacity.

The amount of initial retention was calculated from the volume of spray necessary to cause incipient run-off, using the atomizer and pendulum method [loc. cit.], there being no preferential retention of the solid phase in the system under investigation. Tenacity was determined by spraying with an amount of suspension not exceeding that required for run-off, and after drying for 24 hours, atomizing with water for 1 minute at 1·5 atmospheres pressure (the pendulum being removed), and determining the copper present colorimetrically after solution in nitric acid.

In experiments with 16 spray supplements the authors found that in most of the systems examined the initial retention is the same as that of the aqueous phase, but in a number the presence of solid reduces initial retention. There was some indication that the addition of solid particles affected the wetting properties of the spray while the effect was also found not to be independent of the nature of the surface sprayed.

The tenacity of a spray deposit was found to be dependent upon the characters of the spray supplement, of the solid particle, and of the surface sprayed. Generally speaking, tenacity is determined by the relative ease of wetting the spray deposit and accordingly is comparatively higher upon surfaces wetted with difficulty; supplements yielding residues insoluble in cold water increase tenacity, whereas those highly surface active, especially at high concentrations, diminish it, and oils, both hydrocarbon and glyceride, enhance it.

The results obtained in field experiments showed that the initial retention, as estimated from the first foliage samplings after spraying, agreed satisfactorily with the estimates made in the laboratory. Similarly laboratory determination of the relative effects of spray supplements on tenacity corresponded with those deduced from field trials (from the amounts of residue in later samplings).

WILSON (J. D.) & YOUNG (H. C.). **Stability of formaldehyde dust prepared with different absorbents.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 185, pp. 53–56, 1937.

In a further test of the keeping quality of formaldehyde dusts [*R.A.M.*, xvi, p. 441], that prepared with kaolin diminished in formaldehyde content after 13 months storage by 1·6 per cent., while the percentage loss with kaolin and infusorial earth was 2·6; sawdust, 3·5; infusorial earth, 4·2; grain hulls (form-o-fume), 6·3; kaolin+trioxymethylene, 7·1; formacide (Hammond Paint and Chemical Co.) 9·3; and muck+kaolin (formo-dust), 13·6. It is concluded that kaolin, infusorial earth, sawdust, and grain hulls are satisfactory absorbents for the preparation of formaldehyde dusts which are to be kept for a prolonged period before use, but that charcoal, muck, marl, and gypsum should not be used unless the dust is to be employed immediately.

MERRILL (R. M.). **Water vapor for agricultural spraying.**—*Agric. Engng, St Joseph, Mich.*, xviii, 5, p. 216, 1937.

Water vapour has been used as a carrier for the application of various plant protectives in preliminary experiments during the last two years at the Ohio Agricultural Experiment Station. The vapour generator used in the tests was a commercial machine designed for cleaning purposes, with a flash boiler as the generator unit and a pressure atomizing fuel oil burner for heat, and the apparatus was modified so that the fungicide was pumped from an auxiliary tank into the vapour delivery line. The spraying preparations used included lime-sulphur, wettable sulphur, Bordeaux mixture, and copper oxychloride. Effective treatments were made on apple against scab [*Venturia inaequalis*] and cherry against leaf spot [*Coccomyces hiemalis*: *R.A.M.*, xv, p. 2] with about one-third to one-fourth of the material ordinarily used with standard appliances.

BOUTARIC (A.). **La mouillabilité des bouillies. Conditions à remplir par un mouillant.** [The wettability of spraying mixtures. Conditions required from a wetter.]—*Rev. Vitic., Paris*, lxxxv, 2233, pp. 263–265, 1937.

After referring to the various substances that from time to time have been suggested for use as wetters or spreaders for plant protective sprays, the author states that the time factor involved in Héranger's first definition of 'mouillance' [*R.A.M.*, xiv, p. 556; xvi, p. 331] is not usually taken into consideration in the conception of the 'wettability' of a liquid, which, in his opinion, could be better defined in inverse terms of the thickness of the liquid film formed by the spray fluid over a unit of area. Héranger's statement that 'lowering the surface tension of a liquid also lowers its viscosity' was not borne out by experiment, for the author and his collaborators found that the addition to a fluid of a substance which reduces surface tension usually increases the viscosity of the liquid.

COONS (G. H.). **Progress in plant pathology: control of disease by resistant varieties.**—*Phytopathology*, xxvii, 5, pp. 622–632, 1 graph, 1937.

This is an interesting and suggestive review of recent developments, illustrated by some outstanding instances [reference to which has been made from time to time in this *Review*] in the breeding of disease-resistant varieties of economic plants [*R.A.M.*, xvi, p. 549]. From an analysis of the relevant statistical data the writer concludes that the cultivation of such varieties adds at least $60,000,000 to $70,000,000 per annum to the farm wealth of the United States and indirectly benefits the national resources by a much higher figure—probably double.

SIGRIANSKY (A. M.). Справочник агронома по борьбе с болезнями сельскохозяйственных растений. [The agronomist's manual on the control of diseases of agricultural plants.]—615 pp., 510 figs., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Moscow, 1936. [Received April, 1937.]

This semi-popular manual, compiled by a group of specialists under

the general editorship of Sigriansky, deals with practically all the diseases of bacterial, fungal, or virus origin known to occur on the territory of the U.S.S.R. on agricultural, industrial, and pharmaceutical plants, both in the field and in storage. Separate chapters are given to a technical discussion of the more common fungicides, and to an account of the apparatus for seed and soil disinfection, and a nine-page Russian bibliography is appended.

Naoumoff (N. A.). Методы микологических и фитопатологических исследований. [Methods of mycological and phytopathological investigations.]—272 pp., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Leningrad, 1937.

After briefly indicating in an introductory chapter the purposes, significance, and limitations of the study of micro-organisms in culture, the author gives a detailed description of the latest cultural technique developed in the U.S.S.R. and other countries. The main body of the book is divided into two parts, the first of which deals with the isolation and cultivation of fungi, both pure saprophytes and those pathogenic to plants, man, and animals, a special chapter being given to the preparation of media, and the second part with the study of the obligate parasites on the host plants under experimental conditions. In both parts special methods applicable to individual fungi or allied species are discussed separately under their respective orders. An extensive bibliography is appended to each section of the book, which is supplied with an index of the organisms dealt with.

Gutner (L. S.), Dobrozrakova (Mme T. L.), Letoff (A. S.), & Stepanoff (K. M.). Определитель болезней растений по внешним признакам. [Key to plant diseases by their external symptoms.]—287 pp., 58 pl., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Leningrad, 1937.

This is a collection of dichotomous keys for the determination by their macroscopic symptoms of 1,863 parasitic (fungal, bacterial, and virus) and functional diseases of 134 crop plants cultivated in the U.S.S.R. [cf. *R.A.M.*, xii, p. 306], including a few not yet known in that country and the exclusion of which is attempted by quarantine measures.

Reports on the work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom 1934–1935. —338 pp., H.M. Stationery Office, 1937.

This report, prepared on similar lines to those of previous years [*R.A.M.*, xv, p. 342], comprises summaries of the work in progress at the various British research stations and advisory centres throughout the United Kingdom.

Renn (C. E.). **The Eel-Grass situation along the middle Atlantic Coast.** —*Ecology*, xviii, 2, pp. 323–325, 1937.

During the five years that have elapsed since the appearance of the wasting disease of *Zostera marina* along the American Atlantic coast [*R.A.M.*, xvi, p. 113] the reports received have indicated a progressive

increase in the number of new beds and an extension of refoliated range. The plant persists in profusion through the summer only in a few areas; usually the *Labyrinthula*-infected leaves slough off early in the season, leaving sparsely developed stems, but in certain localities thick grass has abounded in spite of heavy infection. During warm weather the parasite is very active and may destroy the plants within a few days of the appearance of spotting or streaking. The results of a survey early in June, 1936 [loc. cit.] are given in detail; in the course of this it was observed that seedlings were uncommon in the foliated areas, indicating that growth occurs chiefly from persistent stem stock. It is expected that long, cool springs will accelerate the spread of the beds, while rapid warming of the water will shorten vegetative development and favour infection.

BRENCHLEY (WINIFRED E.). **Some deficiency diseases of crop plants.**—*J. Minist. Agric.*, xliv, 2, pp. 116–122, 1937.

In this popular article examples of boron, manganese, copper, and zinc deficiency diseases are given, and their investigation and control reviewed. The author suggests that the probably increasing prevalence of diseases of this type may be due to exhaustion caused by the growing practice of replacing organic manures, containing a wide variety of elements, by artificials, the improving purity of which tends still further to exclude traces of the relevant essential substances. Special applications to correct deficiencies should be made with caution, since in excess they are toxic; and for this reason it is considered to be inadvisable to incorporate borax, manganese sulphate, and the like in compound fertilizers intended for general use.

CHESTER (K. S.). **A critique of plant serology. Part I. The nature and utilization of phytoserological procedures.**—*Quart. Rev. Biol.*, xii, 1, pp. 19–46, 1937.

Following a brief introductory survey explaining the nature of serology and defining the scope of his studies on the subject, the author critically discusses the following aspects of the theme: preparation of plant antigens and immune sera, precipitation, anaphylactic, lytic, and agglutination reactions, acquired resistance to plant pathogens and toxins, and other serological tests with plant antigens [*R.A.M.*, xvi, p. 66, and below, p. 700].

ISAKOVA (Mme A. A.) & SMIRNOVA (Mme A.). **The influence of various microbe complexes of bacteriorhizas on the development of higher plants.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xiv, 6, pp. 397–398, 1937.

In continuation of the investigations described in a recent communication by the first-named author [*R.A.M.*, xvi, p. 334], a summarized account is given of experiments on the effect of suspensions, introduced under the seeds at planting, of bacterial complexes (bacteriorrhiza), obtained by washing the roots of buckwheat, mustard, lupins, wheat, or isolated from soil mixtures, on the germination and development of wheat and mustard. In the treated pots the germination of the seed of both plants was completed by the fifth day, whereas in the control pots it was only completed by the ninth day. While all the bacteriorrhiza

tested had an accelerating and stimulating effect on the development of wheat, the lupin complex was the most active in advancing (by eight days) the flowering stage, and that of mustard in stimulating the growth in height of the host, the stalk of the treated plants attaining 47·5 cm. in height, as against 31·5 for the controls, at the flowering stage. The mustard, soil mixture, and lupin complexes also increased the grain to straw ratio from 0·35 in the controls, to 0·65, 0·60, and 0·50 for the treated plants, respectively. The lupin and soil mixture complexes accelerated the flower bud stage of mustard by 10 days, wheat bacteriorrhiza by 6 or 7 days, while that of buckwheat was without effect. These results are considered to show that the influence of various bacterial complexes is specific as regard different plants, and that there is no uniformity in their action.

SPRAU (F.). **Beiträge zur Mykorrhizenfrage. Die Fruktifikation eines aus Orchis masculus isolierten Wurzelpilzes, Corticium masculi nov. spec.** [Contributions to the mycorrhiza problem. The fructification of a root fungus isolated from *Orchis masculus*, *Corticium masculi* nov. spec.]—*Jb. wiss. Bot.*, lviii, 2, pp. 151–168, 7 figs., 1937.

Clamp-connexions were formed in pure culture by a fungus isolated from *Orchis masculus* roots in the Rhön mountains (Bavaria), followed six weeks later by the development of clavate to sub-cylindrical basidia, with a maximum width of 4·5 to 5·6 μ, 5 to 8 (generally 6 or 7) awl-shaped sterigmata, slightly curved outwards, 3·5 to 3·8 μ long by 1·5 to 1·8 μ at the site of insertion, and thin-walled, smooth, oval, or very slightly reniform, hyaline spores, 3·5 to 4·2 by 2·4 to 3 μ. Single spore cultures yielded mycelium with clamp-connexions, and the fungus is therefore evidently homothallic. A similar isolation from Geisenheim (Rhine) did not form clamp-connexions and remained sterile. In 1 per cent. starch agar cultures and on *Polypodium* roots the fungus forms monilioid elements and sclerotia; it induces the germination of *O. masculus* seeds and is able to live in symbiosis with the plant. It is related to *Corticium varians* and *C.* (*Hypochnus*) *catonii* [*R.A.M.*, xv, pp. 41, 243], but does not agree completely with either species and is accordingly named *C. masculi* n. sp. [without a Latin diagnosis]. A close relationship with the *Rhizoctonia* spp. associated with indigenous soil orchids [cf. ibid., xvi, p. 466] is further indicated by the capacity of *C. masculi* for stimulating seed germination and entering into a symbiotic partnership with its host.

FRASER (LILIAN). **The distribution of sooty-mould fungi and its relation to certain aspects of their physiology.**—*Proc. Linn. Soc. N.S.W.*, lxii, 1–2, pp. 35–56, 1 pl., 1 fig., 7 graphs, 1937.

The author records observations in nature and numerous cultural experiments which indicate that the factors determining distribution of sooty mould colonies [*R.A.M.*, xv, p. 530] are mainly the comparative resistance to heat and desiccation of these fungi, which are able to grow slowly only during humid periods, while in culture it was found that the composition of the medium may modify the degree of such resistance. Though a considerable degree of dry heat is tolerated, the moulds

are very susceptible to moist heat. In some cases they are restricted to the excretions of specific insects, to the distribution of which they are thus limited.

With some exceptions, species of sooty mould fungi do not exercise an appreciable staling effect on one another. Their secretions do, however, strongly retard the growth of *Penicillium*, and it is suggested that the low incidence of common saprophytes on honey-dew may be due to this cause, to their susceptibility to exposure to heat and desiccation, and to the fact that adonite, the chief constituent of the honey-dew of *Ceroplastes destructor* is not specially suitable for their growth, though it is very suitable for sooty moulds. During wet periods, when most of these conditions are mitigated, *Penicillium*, *Alternaria*, *Fusarium*, and other fungi occur more abundantly in sooty mould colonies.

It appears that the habitat of the sooty mould-forming fungi is determined by their slow rate of growth, their ability to make use of slight and intermittent supplies of water, their resistance to heat and dryness, and the suitability of honey-dew as a medium. The fact that they are usually found fruiting may be due to the stimulating effect on sporulation of the secretions of other species with which they are usually associated, and probably also to the ultra-violet radiation of sunlight to which they are exposed.

EDWARDS (H. I.) & NEWTON (W.). **The physiology of Rhizoctonia solani Kühn. V. The activity of certain enzymes of Rhizoctonia solani Kühn.**—*Sci. Agric.*, xvii, 5, pp. 544–549, 1937. [French summary.]

A number of strains of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvi, p. 338] obtained from different hosts were morphologically identical in culture, and in an attempt made by the authors to devise a biochemical method of differentiating them it was found that they could be distinguished by their enzyme activities.

A study of the invertase activity indicated that three strains isolated from wheat were distinct, and that therefore several physiological forms may attack the same host species; while on the other hand strains from aster [*Callistephus chinensis*] and potato were similar. Invertase activity alone is not an adequate indicator, however, and that of other enzymes was investigated in the hope of developing a more satisfactory technique by observing the effect of various nitrogen compounds in the nutrient media. When peptone was the sole source of nitrogen, enzyme activity was high, possibly owing to the protection of the enzymes against hydrolysis, and was not increased by the addition of nitrate and ammonium salts; while it was low in media containing gelatine, potassium nitrate, ammonium sulphate, or urea.

FRÉMONT (THÉRÈSE). **Extension de techniques employées en pathologie animale à l'étude des réactions de la cellule végétale à certaines infections.** [An extension of the technical methods employed in animal pathology to the study of the reactions of plant cells to certain infections.]—*Ann. Inst. Pasteur*, lviii, 5, pp. 531–589, 3 diags., 1937.

By an adaptation of the serological technique commonly applied in studies of animal immunology, the writer investigated the reactions of

bean (*Phaseolus vulgaris* and *Vicia faba*), onion, and potato tissues to inoculation with various bacteria, e.g. *Bacillus proteus* [*Bacterium proteus-vulgaris*], *B. gärtneri* [*Salmonella enteritidis*], and *B.* [*Bact.*] *coli*, not normally pathogenic to these plants. The colour, density, stability, acidity, and other properties of the extracts of inoculated plants were found to differ widely from those of healthy ones, and the results of inoculation experiments on animals clearly demonstrated the formation by the infected plants of antigens capable of modifying the virulence of the organism. It is concluded on the basis of these experiments that far-reaching analogies exist between animal and plant cells in respect of acquired immunity from infectious diseases [*R.A.M.*, xv, p. 678, and above, p. 698].

McKay (R.). **Potassium permanganate as an aid to the production of asexual fructifications by Phytophthora erythroseptica Pethybr.**—*Nature, Lond.*, cxxxix, 3523, p. 802, 1937.

The author states that the production of zoosporangia in six- to twelve-month-old cultures of *Phytophthora erythroseptica* [*R.A.M.*, xiii, p. 531] can be stimulated by the addition of a little permanganate solution to the transfer water, the procedure recommended being to place portions of the medium (ground Quaker oats agar) in which the fungus is cultivated in drops of tap water on glass slides laid on white paper, and to add a 0·01 to 0·02 per cent. permanganate solution until a faint pink colour is just discernible. A cover slip is then placed over the preparation, which is incubated in a moist chamber at 16° to 20° C. The production of the fructifications reaches its maximum in 84 to 86 hours.

Bredemann (G.) & Radeloff (H.). **Über Fluor-Rauchschäden. Fluoraufnahme durch die Rinde der Sprosse und ihre Wirkung.** [On fluorine smoke injury. Fluorine assimilation by the cortex of shoots and its action.]—*Angew. Bot.*, xix, 2, pp. 172–181, 1937.

Microchemical analyses of the fluorine assimilation of certain fruit trees, hardwoods, vegetables, and ornamentals at the Hamburg Institute of Applied Botany showed that both summer and winter exposures to the gas lead to the accumulation of large quantities, both in water-soluble and insoluble form, in the cortex and occasionally also in the xylem. From the standpoint of assessing practical damage from factory emanations and the like [*R.A.M.*, xv, p. 267], it should be noted that twig and shoot development is not appreciably impaired by the accumulation of fluorine compounds in the cortex, though desiccation may result from excessive or protracted absorption. The fluorine does not persist in the newly-formed shoots of trees, herbaceous plants, or bulbs transferred to a smokeless atmosphere, so that the presence of the gas in these organs necessarily connotes re-exposure to toxic exhalations.

Whitehead (T.). **Virus diseases of the Potato. The 'carrier' problem. Its relation to symptomatology and commercial Potato growing.**—*Ann. appl. Biol.*, xxiv, 2, pp. 323–341, 1 pl., 1937.

In this critical review of the results achieved in the study of 'carriers' of potato viruses the author points out that no fundamental difference exists between carrying and masking, though the former is regarded as

a permanent, and the latter merely a temporary phenomenon. The plant cell is the symptomatological unit and discontinuous symptoms are interpreted as implying localized impotence in tissues surrounded by others in which the host protoplasm is dominant. Atypical reactions of carrier varieties need to be taken into account in segregating viruses. The plant can modify the virulence of a virus or even apparently destroy it, the tissues traversed by the virus becoming virus-free or the virus-infected plant recovering, with the complete elimination of the virus. The full range of symptoms possible in a plant require to be determined in virus segregation and diagnosis and not merely the average symptoms obtained under the particular conditions favoured by each worker. Examples of the breakdown of carrying power are cited and this factor discussed in relation to the description of new viruses. The permanent masking of symptoms until the plant reaches maturity represents the converse of such breakdown. No diminution of vigour or cropping power has been observed in carrier plants, in fact a carrier may exhibit reduced susceptibility to certain of the viruses present in the field.

Field trials on the transmission of the carried viruses paracrinkle (Bawden's E) in King Edward VII potatoes and virus X and streak [*R.A.M.*, xvi, p. 337] in Up-to-Date to Arran Victory, Great Scot, and Majestic, mostly intolerant to these viruses, showed that neither virus was transmitted to the latter varieties when growing in rows adjacent to either of the two former. These carrier varieties, therefore, do not constitute the serious menace to other susceptible varieties as is commonly suspected.

KÖHLER (E.). **Ueber ein 'Veinbanding-Virus' der Kartoffel.** [On a 'veinbanding virus' of the Potato.]—*Phytopath. Z.*, x, 1, pp. 17–29, 7 figs., 1937.

Continuing his studies on the 'P' virus of potatoes [*R.A.M.*, xv, p. 391], the writer observed that field plants of the Direktor Johanssen and Industrie varieties, from which the virus was transmissible in a pure state to Samson tobacco, showed extensive mottling and leaf curl, which disappeared in the height of summer in a similar manner to 'Yr' (a weak variant of Y) detected some years ago in an east German selection. The symptoms in the Y-susceptible Goldfink variety were much less conspicuous, while in Erdgold they were barely perceptible. The same relationships, in an intensified form, were observed on greenhouse plants.

The indeterminate symptoms induced by the 'P' virus on Samson tobacco [loc. cit.] are readily distinguishable from those caused by Y or by mixed infections with X+P and X+Y. On White Burley, 'P' produces the well-marked veinbanding described by Phyllis Clinch and Loughnane for their A virus [ibid., xvi, pp. 116, 117]. On *Nicotiana alata*, which contracts a severe spotting on inoculation with Y, the 'P' virus remains latent. In combined inoculations on tobacco leaves with 'P' and various strains of the potato ring spot and mottle types of the X virus [ibid., xvi, p. 550], the influence of the former was apparent in distinct aberrations from the ordinary symptoms. No protective action against Y was conferred on White Burley tobacco by previous inoculation with 'P'.

Positive results were given by experiments in the transmission of 'P' from Erdgold potato foliage to potato sprouts by means of *Myzus persicae*, whereas attempts to convey it by the same means from tobacco to tobacco were unsuccessful.

The results of these studies are considered to establish the identity of 'P' with A [see next abstract], 'Yr', and Koch and Johnson's 'veinbanding virus' [ibid., xiv, p. 524], and it is suggested that 'A' be adopted as a convenient international symbol of the infective principle concerned. The close relationship of A with Y is indisputable, and possibly both may be regarded as more or less stable, interchangeable variants of one and the same virus.

Köhler (E.). **Zur Frage der Schutzimpfung bei den Veinbanding-Viren. (Vorläufige Mitteilung.)** [On the question of protective inoculation in the veinbanding viruses. (Preliminary note.)]—*NachrBl. dtsch. PflSchDienst*, xvii, 4, pp. 32–33, 1937.

In the course of further studies on the 'P' virus [see preceding abstract], the writer found that one of the veinbanding strains (2A) of this relatively mild group differed from the forms of 'P' hitherto encountered in the production of somewhat more acute symptoms (though not nearly as intense as those due to the Y virus proper) and conspicuous interveinal spotting both on Samson and White Burley tobacco. Neither 2A nor the two 'P' forms tested (716/17 and 716/12) were capable of conferring a reciprocally protective action on tobacco against subsequent inoculation, thereby excluding the possibility of relationship. There are thus apparently two weak veinbanding virus groups, of which 2A, like Salaman's strain [see next abstract], is a feeble variant of Y, while the 'P' forms (identical with A) represent an entirely unrelated principle.

Salaman (R. N.). **Acquired immunity against the 'Y' Potato virus.**—*Nature, Lond.*, cxxxix, 3526, pp. 924–925, 2 figs., 1937.

Sap inoculations from witches' broom-like outgrowths at the base of otherwise healthy *Schizanthus retusus* plants to tobacco resulted in a dull vein-clearing, followed by a faint mottle and inconspicuous veinbanding on the older leaves, all of which are characteristic of the Y virus [see preceding and next abstracts] in an attenuated form. Passage through its own host induced a further considerable weakening of the virus, as judged by its reaction on tobacco. The new strain exerted an immunizing effect on tobacco against further infection by the normal Y virus [*R.A.M.*, xvi, p. 483] but was insufficiently attenuated to confer a similar protective action on potatoes [ibid., xvi, p. 630]; a further reduction of its potency was effected by placing tobacco root fibres infected with both weak and strong forms of the virus in Erlenmeyer flasks containing nutrient fluid under sterile conditions at 22°, 35°, and 40° C. After about a week the virus extracted from the cultures showed sufficient attenuation to afford complete and partial protection, respectively, to tobacco and potato (President and Up-to-Date); nearly 100 weak strains were secured by this method. Slightly better results were obtained at the higher temperature ranges, but there was little or no difference between the strains originating from strong or weak infections.

The author concludes that the possibility of inducing immunity from one of the worst potato viruses is brought appreciably nearer by this work. The witches' brooms on *S. retusus* are stated not to be due to the weak Y virus.

BÄRNER (J.). **'Intrazellulare Stäbe' bei viruskranken Tabak- und Kartoffelpflanzen.** ['Intracellular cordons' in virus-diseased Tobacco and Potato plants.]—*NachrBl. dtsch. PflSchDienst*, xvii, 4, pp. 33–34, 1 fig., 1937.

The writer detected the presence of 'intracellular cordons', similar to those associated with vine 'reisig' disease [*R.A.M.*, xvi, pp. 231, 622] in potato and White Burley tobacco plants infected by the Y virus [see preceding abstracts]. In phloroglucin-hydrochloric acid xylem preparations the 'cordons', which measure up to 56 by 3·8 μ, remain colourless in contrast to the vivid red of the tracheal walls. The occurrence of these elements in the tissues is interpreted, by analogy with their significance in relation to vine 'reisig' disease, as representing an early stage of virus infection.

KÖHLER (E.). **Fortgeführte Untersuchungen mit verschiedenen Stämmen des X-Virus der Kartoffel (Ringmosaikvirus).** [Continued investigations on various strains of the X virus of the Potato (ring mosaic virus).]—*Phytopath. Z.*, x, 1, pp. 31–41, 4 figs., 1937.

The two groups into which the various constant types of potato ring mosaic with specific properties previously described [*R.A.M.*, xv, p. 390] have been found to fall are designated X_I and X_{II}, the former containing Ers virus and its strains 25 and 34 and probably Koch's potato mottle [ibid., xiv, p. 523], and the latter M 23, H 19 and its weaker variants Mb 12 and E_1, Cs, probably Koch's potato ring spot virus [loc. cit.], and Bawden's X, D, and B viruses [ibid., xvi, p. 53]. The representatives of X_I differ from those of X_{II} not only in their symptomatology and greater thermostability, but also (and most significantly) in the absence of any mutually protective action between members of the two groups, that is to say, plant organs permeated by a virus of X_I are immune from subsequent infection by one of the same group but not by an X_{II} virus.

In addition to the information already presented on the Ers and Cs viruses [ibid., xv, p. 391], it is here stated that Ers 25 differs from all other known X strains in the initial production on Samson tobacco leaves of expanding, chlorotic, circular lesions instead of rings, a similar manifestation being observed also on *Nicotiana alata* and other *N.* spp. The virus is readily transmissible to *Datura stramonium*. The incubation period of the weak strain Ers 34 was about double the normal. Besides the 'normal' Cs A (tortoise-shell) strain, a much stronger variant (Cs 35), producing severe and persistent necrosis of tobacco foliage, was differentiated. Mixed infections with Ers 25 and Cs A on tobacco plants led to the development of a peculiar blend of symptoms and to arrested growth, thereby confirming the absence of close affinity between the two strains, since combined inoculations with nearly related X viruses ordinarily tend either to the development of indefinite pathological phenomena or to the predominance of one pa tner over the other.

Hansen (H. P.) **Spredningsbetingelser for Kartoffelens Virussygdomme i Forhold til praktisk Kartoffelfremavl.** [Conditions of spread of Potato virus diseases in relation to practical Potato propagation.] —Reprinted from *Ugeskr. Landm.*, *1937*, 4 pp., 1937.

The only potato viruses observed by the writer in Denmark are X, Y, A [see preceding abstracts] and leaf roll; giant hill [*R.A.M.*, xv, p. 460] also occurs, but this disorder is not definitely known to be due to a virus. In connexion with some outstanding recent contributions to the knowledge of the transmission of potato viruses by aphids, a scheme is propounded for the production of virus-free seed potatoes on island farms, whence the tubers would be sent for propagation to suitable mainland stations, selected for their humid, cool, and windy climate, absence of crucifers on which the aphids overwinter, and isolation from infected areas [ibid., xvi, pp. 52, 551].

Wartenberg (H.). **Ueber die Pufferung der Preßsäfte abbaukranker und gesunder Knollen der Kartoffel.** [On the buffering of the expressed juices of degeneration-diseased and sound Potato tubers.]—*Phytopath. Z.*, x, 1, pp. 43–56, 4 graphs, 1937.

Analyses by the electrometric method of the expressed juices of 'degenerate' and sound potato (Erstling [Duke of York], Parnassia, and Paul Krüger [President]) plants showed that buffering was stronger in the former than in the latter [*R.A.M.*, xvi, p. 486]. The phenomenon was most pronounced in the leaves and least in the stems, the tubers being intermediate in this respect. The expressed juices of tobacco plants artificially inoculated with the X and Y viruses [see preceding abstracts] did not differ from those of healthy material, whereas in the case of a mixed X+Y infection buffering was much stronger in the diseased than in healthy juices. These observations, while individually accurate, do not at present throw any light on the etiology or course of degeneration, nor are sufficient statistical data available at the present stage to form a judgment of general validity on the relationship (if any) between the extent of buffering in the juice and the state of health of the potato.

Ramshorn (K.). **Zur Physiologie des sog. Kartoffelabbaues. II. Über eine formative Wirkung von Heteroauxin auf das Austreiben von Kartoffelknollen.** [On the physiology of the so-called Potato degeneration. II. On a formative action of heteroauxin on the germination of Potato tubers.]—*Planta*, xxvi, 5, pp. 737–750, 4 figs., 1937.

Having observed that the progeny of 'degenerate' potatoes [see preceding abstract] showed an annually increasing tendency to germinate by means of numerous long, thin shoots distributed at random over the tuber, instead of by the normal method of short, vigorous shoots at the apical end, the writer carried out a series of experiments on the Erdgold, Odenwälder Blaue, and Wekaragis varieties to determine the possible relationship of this phenomenon to the problem of deterioration as a whole.

The decapitation of all buds except the terminal one failed to induce normal polarization of germination, and the effect of the application of heteroauxin (indolyl acetic acid in a lanoline paste) [see above, p. 689]

to the tubers was accordingly tested, the substance being introduced through slits in the apical end before planting out in the spring of 1935. In the case of Erdgold there was no immediate increase of yield in comparison with the controls, but the tubers from the treated plants germinated normally and the 1936 crop developed satisfactorily and gave rise to offspring showing the normal type of germination at the end of the winter 1936–7. The controls (receiving lanoline paste alone) made poor growth and germinated abnormally as described above. Odenwälder Blaue and Wekaragis tubers reacted during the first season after treatment by increased yields.

The treatment of the tubers with heteroauxin before the inception of germination induces characteristic reactions. Direct application almost invariably retards the development of the 'eyes' in healthy tubers, while this response is less frequent in diseased material. The disturbance of polarity in the germination of 'degenerate' tubers is attributed to auxin deficiency in relation to other physiological components, and the possibility arises that the whole essence of deterioration may reside in an insufficiency of growth-promoting elements curable by heteroauxin treatment on the lines herein indicated.

Jahnel (H.). **Wuchsstoffuntersuchungen an abbaukranken Kartoffeln.** [Auxin investigations on degenerate Potatoes.]—*Phytopath. Z.*, x, 1, pp. 113–117, 1 graph, 1937.

The emulsion of young 'degenerate' Direktor Johanssen, Odenwälder Blaue, and Parnassia potato tubers yielded 30 per cent. less auxins than that of sound material, and the leaf spindles of diseased plants required a higher heteroauxin [see preceding abstract] concentration to produce normal curving than those of healthy ones. A disturbance in the hormone metabolism of degenerate plants would thus appear to be indicated.

Wartenberg (H.) & Klinkowski (M.). **Eine 'Jodprobe' zur Pflanzgutwertbestimmung der Kartoffel. Vorläufige Mitteilung aus Untersuchungen.** [An 'iodine test' of the value of Potatoes for seed. Preliminary note on the investigations.]—*Phytopath. Z.*, x, 1, pp. 107–109, 1937.

In preliminary experiments the 'iodine test' of the value of potatoes for seed was applied as follows. Equal quantities of expressed 'degenerate' [see preceding abstract] and healthy tuber juice and starch solution are mixed in a test tube with a uniform amount of iodine; after a certain time (one hour if small quantities of iodine are used, longer for larger amounts) the entire contents of the tube turn blue-black in the case of the healthy material, whereas in that of the diseased only the sediment at or near the bottom is discoloured. The most suitable proportions of juice, starch, and iodine for this purpose have not yet been calculated.

Topekha (Mme E. F.). **Biochemie der Viruserkrankungen von Kartoffeln.** [Biochemistry of Potato virus diseases.]—*Bull. appl. Bot. Select.*, xiv, pp. 53–67, 1936. [Russian, with English summary. Abs. in *Ber. wiss. Biol.*, xliii, 3–4, p. 216, 1937.]

In comparative biochemical tests (forming part of a systematic study on the physiology, biochemistry, and anatomy of plants in the U.S.S.R.)

on potato tubers from sound plants and from those affected by leaf roll, mosaic, and other virus diseases [see preceding abstracts], the most striking difference between the two lots was in the dehydrase activity of the juice extracts, those of diseased tubers much more rapidly decolorizing a methylene blue solution than those of healthy ones [*R.A.M.*, xv, p. 822], irrespective of the duration of the resting period. Generally speaking, peroxidase and catalase activity is more intense in diseased than in sound tubers, though in respect of the former there is no difference between the two lots by the close of the resting period. Diseased tubers contain larger amounts of albumin nitrogen than healthy ones, evidently in consequence of the relative inactivity of the proteolytic ferments in the former. There is no change in the ascorbic acid content of diseased tubers [cf. ibid., xiv, p. 785 *et passim*].

KÖHLER (E.). **Versuche über Pfropfung und Akronekrose bei Kartoffeln. Vorläufige Mitteilung.** [Experiments on grafting and acronecrosis in Potatoes. Preliminary note.]—*Angew. Bot.*, xix, 2, pp. 158–160, 1937.

The writer records the development of severe acronecrosis [*R.A.M.*, xvi, pp. 53, 480] on grafts of Spätrot (virus-free) on Duke of York potatoes (carrying virus X) and of mild symptoms of the same disorder in the reciprocal combination. In the latter case the toxins produced in the stock by the action of the virus apparently permeate the scion and cause mild injury, while in the former the severe symptoms are primarily due to the toxic substance formed under the influence of the virus, and only secondarily, or not at all, to the virus itself. A somewhat analogous phenomenon was observed in grafts of the susceptible Wohltmann on the semi-immune Ackersegen and vice versa, but in other cases, e.g., Duke of York on Silesia (virus-free) and reciprocally, toxin formation was evidently absent. There is reason to believe that the toxin partially immobilizes or destroys the virus itself in the plant tissues.

NOVOTELNOVA (Mme N. S.). Влияние температуры и влажности на прорастание конидий **Phytophthora infestans (Mont.) de Bary.** [Influence of temperature and humidity on the germination of the conidia of *Phytophthora infestans* (Mont.) de Bary.]—*Pl. Prot., Leningr., 1937*, 12, pp. 79–88, 2 figs., 1 graph, 1937. [English summary.]

In studies on the germination of conidia of *Phytophthora infestans* [*R.A.M.*, xiii, p. 724; xv, p. 45], the author found that direct germination (by germ-tubes) occurred within a temperature range of 4° to 30° C., indirect germination (by zoospores) between 6° to 21° only, and combined germination (in which the germ-tube originally formed is transformed into a secondary conidium, germinating directly or indirectly) between 24° and 30°. The optimum temperature was 25° for direct, 10° to 15° for indirect, and 24° to 28° for combined germination. The conidia withstood four hours at 35° and 48 hours at 1° to 2°, but under dry conditions they rapidly lost their viability (within 30 mins.). The appearance of *P. infestans* in epidemic form is correlated with rain or dew combined with comparatively low temperatures, conditions which promote the germination of zoospores.

Taylor (C. F.) & Blodgett (F. M.). **Control of a wilt disease of Potato by formaldehyde dust.**—*Amer. Potato J.*, xiv, 5, pp. 154–157, 1937.

A wilt disease closely resembling that caused by *Fusarium* [*solani* var.] *eumartii* [*R.A.M.*, xvi, p. 489] is stated to have spread alarmingly among the western New York potato crops during the last few seasons. The first symptom on Rurals is a bronzing of the leaflets just below the apex of the stem, followed by an increasingly severe, frequently unilateral, yellowing and necrosis. Brown necrotic areas, usually larger and darker than those associated with yellow dwarf [ibid., xvi, p. 56], develop in the pith of the stem, especially at the nodes. The mature tubers show a dark brown discoloration of the vascular system, often surrounded by a water-soaked zone. The disease, locally known as 'Z', was occasionally present in fields used during the past three years for scab [*Actinomyces scabies*] control experiments, in the course of which it was observed that the former was much reduced by 8 per cent. formaldehyde dust (1 lb. commercial formalin to 4 lb. uncalcined celite, 3 oz. per bush. of seed pieces). The treatment, however, must be followed by immediate planting if heavy decreases in stand and yield are to be obviated.

Stapp (C.). **Weitere Beiträge zur Frage der Widerstandsfähigkeit verschiedener Kartoffelsorten gegen Schwarzbeinigkeit und Knollennassfäule, verursacht durch Bacterium phytophthorum Appel.** [Further contributions to the question of the resistance of different Potato varieties to blackleg and tuber wet rot caused by *Bacterium phytophthorum* Appel.]—*Angew. Bot.*, xix, 2, pp. 141–152, 1937.

Continuing his studies on the varietal resistance of potatoes to blackleg and tuber wet rot caused by *Bacterium phytophthorum* [formerly *Bacillus phytophthorus*: *R.A.M.*, xiv, p. 525], the writer found that only one of the 25 officially recognized varieties tested for this purpose was highly resistant, viz., Sickingen, though Frühe Hörnchen is probably also only slightly susceptible. High and extremely high degrees of susceptibility were shown, respectively, by five (including Parnassia, Starchy I, and Wekaragis) and twelve (including Kaiserkrone, Frühmölle, Edelragis, Altgold, and Rote Mäuse) varieties, eleven of those in the latter group being yellow-fleshed as were also seven out of the eight most susceptible varieties in the earlier investigations, so that a correlation may be presumed to exist between this character and liability to blackleg. No definite connexion could be traced, on the other hand, between susceptibility to *Bact. phytophthorum* and time of maturity, skin texture, capacity for wound periderm formation, or rapidity of dissolution of the parenchyma tissue of the tubers. Of the two strains (14 and 43) of the organism used for inoculation tests since 1928, the former has undergone an annual attenuation of virulence, whereas the pathogenicity of the latter has steadily increased in culture on artificial media.

Ryker (T. C.). **Rice disease investigations.**—*Bienn. Rep. La Rice Exp. Sta., 1935–1936*, pp. 13–14, [? 1937].

Cercospora [? *oryzae*: *R.A.M.*, xvi, p. 405] was widespread and severe during the latter part of the 1935–6 season among Early Prolific and Blue Rose rice crops in Louisiana, a high degree of resistance being

shown by Rexoro, Fortuna, and Nira. This character was observed in F_1 and F_2 crosses of Blue Rose × Rexoro to be dominant and to depend on a single genetic factor.

A species of *Pythium* [ibid., xiv, p. 221] caused a root rot and chlorosis of stands growing under adverse soil conditions associated with excessive alkalinity or low fertility. Inoculation experiments, however, showed the fungus to be pathogenic even to plants in a favourable environment.

The common sheath spot disease of rice, the symptoms of which agree with those described by E. C. Tullis as due to *Trichoderma lignorum* [ibid., xiv, p. 331], has been found to be caused by an apparently new strain of *Rhizoctonia* capable of withstanding exceptionally high temperatures. All the *R.* isolates from 22 collections of diseased material in Louisiana and Texas proved to be highly virulent, both when inoculated directly into the leaf sheaths and when placed in the soil round the growing plants. *T. lignorum* was isolated only in a few cases and gave negative results in inoculation tests.

MURRAY (R. K. S.). **Report of Botanist and Mycologist for 1936.**—*Rep. Rubb. Res. Bd, Ceylon, 1936*, pp. 30–41, 1937.

During 1936, *Oidium* leaf disease of *Hevea* rubber [*O. heveae: R.A.M.*, xvi, pp. 61, 202] and secondary leaf fall due to *Phytophthora palmivora* [ibid., xv, p. 50] caused far less damage in Ceylon, except at altitudes of about 2,000 feet, than in any recent year. Sulphur dusting was less beneficial than is generally the case in the Kalutara and Kelani Valley districts, but in the mid-country estates the contrast between some dusted and undusted areas at high elevations was very striking. During wet weather in June and July, *P. palmivora* again caused extensive leaf fall in a dusted area [loc. cit.]; most estates in Kalutara lost between 25 and 50 per cent. of the leaves, and would have lost more if the wet weather had continued. It is clear that the advisability of sulphur dusting in wet, low-lying areas needs careful consideration. The recommendation made in 1906 was to dust lightly in order to obtain only slight control of *O. heveae* and so allow the fungus to attack the highly susceptible flowers while protecting the leaves; but the incidence of powdery mildew was so slight that no evidence as to the effectiveness of this procedure was obtained. It is now recommended that in low-lying areas dusting should be deferred until the young leaves crinkle, subsequent procedure depending on the course of refoliation and the prevailing weather. In demonstrational work in 1936, it was found that an average area of about 200 to 300 acres can be dusted with one machine in charge of a supervisor, given a 7-day interval between the applications. A more ambitious undertaking would probably cost about 10 rupees per acre per annum [loc. cit.]. A considerable demand for dusting by the larger small estates on a contributory basis may be anticipated but the real smallholder is not prepared to contribute anything to the cost of treatment.

SINGH (J.). **Observations on the microflora of the Punjab soils.**—*Curr. Sci.*, v, 11, p. 589, 1937.

In addition to a number of common soil fungi, representing 13 genera,

the writer isolated from Punjab soils [*R.A.M.*, xv, p. 232] [undetermined] species belonging to the following genera not previously reported as occurring in soil, e.g., *Choanephora*, *Fusicoccum*, *Cytospora*, *Striochaete*, *Mapea*, and *Stemmaria*. Species of those of *Aspergillus* predominated in the warmer soils over *Penicillium*, the latter tending to become more prominent during the winter months, but counts of fungi and actinomycetes on acid Coon's agar show no definite seasonal periodicity for these two groups [cf. ibid., xvi, p. 558].

SVINHUFVUD (V. E.). **Untersuchungen über die bodenmikrobiologischen Unterschiede der Cajander'schen Waldtypen.** [Studies on the soil microbiological differences in the Cajander forest types.]—*Acta for. fenn.*, xliv, 67 pp., 3 graphs, 1937. [Finnish summary.]

In the section of this study dealing with the fungi isolated from five different types of Finnish forest soils the writer enumerates 60 species, among which may be mentioned *Mucor ramannianus*, *M. racemosus* [*R.A.M.*, xvi, p. 558], *M. mucedo*, *M. spinosus* [ibid., xv, p. 823], *M. circinelloides* [ibid., xv, p. 314], *Rhizopus nigricans* [ibid., xvi, p. 558], *Trichoderma koningi*, *T. lignorum*, *Aspergillus* and *Penicillium* spp. (including *A. flavus*, *A. fumigatus*, *A. niger* [ibid., xvi, p. 575], *P. crustaceum*, *P. silvaticum* [ibid., xv, p. 257], and *P. humicola*), *Thamnidium elegans* [loc. cit.], *Briarea elegans*, *Sporotrichum polysporum* and other *S.* spp., *Botrytis fulva*, and *Acrostalagmus albus*. The organisms, especially the Mucorineae, predominated in the superior soil types, and the maximum number of isolations (74) was made in January, the corresponding figures for March and September being 35 and 22, respectively [cf. preceding abstract].

MITCHELL (J. E. M.). **Progress report of the Forest Administration in Coorg for 1935–36.**—59 pp., 1936. [Received July, 1937.]

Some items of interest in connexion with spike disease of sandal (*Santalum album*) [*R.A.M.*, xvi, p. 340] occur in this report. Fresh cases of the disturbance were observed in three villages of the Coorg (Mysore) State forests and immediately suppressed. Trees pollarded in the Bambookadu 1918 area were found to be infected, treated with 'Atlas' [an arsenical tree killer: ibid., xiv, p. 539], and uprooted. A total of 1,468 spiked trees were treated with this preparation in the Fraserpet and Somwarpet Ranges; solution 'A', supplied by the Indian Institute of Science, Bangalore, was more effective than 'B'. Spike disease control operations have also been successfully undertaken in an experimental protective area laid down in 1935.

Informe del Profesor Carlos E. Chardon sobre el 'mosaico' de la Caña de Azucar al Señor Ministro de Agricultura y Comercio Doctor Manuel Jose Vargas. [Report of Prof. Carlos E. Chardon on Sugar-Cane mosaic to the Minister of Agriculture and Commerce, Doctor Manuel Jose Vargas.]—*Agricultura, Bogotá*, ix, 6, pp. 108–120 3 figs., 1937.

Details are given of the writer's observations on mosaic in Colombian sugar-cane plantations on a recent visit of inspection in the course of which, in addition to observations on the rapid spread of the disease

and the heavy losses occasioned thereby, he detected the presence of *Aphis maidis* on *Eleusine indica* and pará grass [*Brachiaria mutica*].

[The same number of this periodical contains anonymous popular articles on sugar-cane mosaic (pp. 121–125, 1 col. pl., 2 figs.) and on the introduction of disease-resistant sugar-cane varieties into Colombia with reference, e.g., to gummosis (*Bacterium vasculorum*) [ibid., xv, p. 317] (pp. 126–135, 1 fig.), and cites an Act of 30th December, 1936, providing for the subsidization by the Government of a campaign for the control of mosaic.]

VIDAL (L. F.). **El 'mosaico' de la Caña de Azucar.** [Sugar-cane mosaic.]—*Rev. Agric., S. Domingo,* xxviii, 89, pp. 55–58; 90, pp. 133–135; 91, pp. 189–195, 1937.

This is a survey of the available information on the history, etiology, symptomatology, mode of propagation, effects on yield, and control of sugar-cane mosaic by field sanitation and the use of resistant varieties in the Dominican Republic [*R.A.M.*, iii, p. 427; vii, p. 21; xi, p. 74].

HINO (I.). **Identification du champignon japonais Reissi ou Mannen-Také avec le Ganoderma lucidum.** [Identification of the Japanese fungus 'Reissi' or 'Mannen-Také' with *Ganoderma lucidum.*]—*Bot. & Zool.*, v, 5, pp. 917–924, 4 figs., 1937. [French summary.]

The author regards *Ganoderma japonicum,* known under the Japanese name of Reissi (sometimes used for other species as well), as merely a local form synonymous with *G. lucidum* [*R.A.M.*, xv, p. 684].

PETRAK (F.). **Verzeichnis der neuen Arten, Varietäten, Formen, Namen und wichtigsten Synonyme der Pilze 1922–1928.** [List of new species, varieties, forms, names, and the most important synonyms of the fungi 1922–1928.]—*Just's Jber.*, lvi (*1928*), Abt. II, 2, pp. 291–480; 3, pp. 481–697, 1937.

This is a list of the new genera, species, varieties, forms and synonyms of fungi recorded in the years 1922 to 1928. The species are arranged alphabetically with full citations of place of publication, the substratum, and the country of origin, new genera being indicated with thick type.

HOLMES (F. O.). **Inheritance of resistance to Tobacco-mosaic disease in the Pepper.**—*Phytopathology,* xxvii, 5, pp. 637–642, 1937.

All varieties of garden pepper (*Capsicum frutescens*) tested proved susceptible to infection by the author's distorting strain of tobacco mosaic (tobacco distorting strain virus 1) [*R.A.M.*, xvi, pp. 129, 414, 417]. In addition to the two types of response previously described, viz., systemic chlorosis and localized necrosis followed by abscission and recovery [ibid., xiv, p. 126], the virus induced two others, namely, delayed necrosis, accompanied by leaf abscission frequently allowing of escape from systemic infection, and systemic necrosis with stem streak and eventual death in all plants. These four reactions were shown by hybridization experiments to be controlled by the three genes L, l^i and l, forming an allelic series in which the first-named (localization of tobacco

mosaic virus) is completely dominant over the other two, representing, respectively, imperfect localization and mottling; l^i is partially dominant over l. Infected plants of genetic constitution ll develop systemic necrosis; l^il^i delayed necrosis with leaf abscission, frequent recovery, and sparse occurrence of secondary lesions; l^il systemic necrosis in all plants; and LL, Ll, and Ll^i localized necrosis with subsequent recovery.

The commonest genetic constitution among the commercial large-fruited, non-pungent peppers is the homozygous recessive ll represented by the popular California Wonder, World Beater, and Ruby King, field infection of which results in yellowish primary lesions, early foliar branching, temporary retardation of growth, eventual mottling, and a heavy reduction of yield. The l^il^i constitution, typical of the Long Red Cayenne and Sunnybrook group, sustains relatively slight damage. Work is in progress on the development of large-fruited strains of the LL constitution.

KOKIN (A. J.). **Физиологическое изучение вредоносности обыкновенной мозаики Табака Дюбек Никитский № 44.** [Physiological study of the injuriousness of common Tobacco mosaic to the Dubec Nikitsky No. 44 variety.]—*Pl. Prot., Leningr., 1937*, 12, pp. 95–112, 1937. [English summary.]

A tabulated account is given of controlled hothouse experiments in Leningrad to test the effect on the tobacco plant (Dubec Nikitsky No. 44 variety) of artificial inoculation at different phases of growth (on the 6th and 7th leaves in series 1 and 12th leaf in series 2) with Johnson's tobacco virus 1. The results showed that transpiration was reduced in the diseased plants, in which it ranged from 47·4 to 91·2 and from 77·3 to 93·2 per cent. of that of healthy plants in series 1 and 2, respectively. The osmotic pressure of the juice of infected leaves was somewhat lower than that of sound foliage. In plants with marked mosaic symptoms assimilation is diminished to 57·4 or even to 42·6 per cent. of the normal rate. The soluble carbohydrate content of mosaic tobacco leaves is lower than that of healthy ones. On the other hand, the infected leaves have higher protein nitrogen, proteid, and nicotine contents than healthy ones [cf. *R.A.M.*, xvi, p. 418], the excess of the last-named amounting to 35 per cent. over sound material in series 1.

The reduction in foliar surface due to mosaic amounted to between 59·6 and 85 per cent. in series 1 and to between 64·5 and 88 per cent. in series 2, the corresponding figures for yield reduction being 34·1 and 37·8 per cent., respectively. The root system is also reduced to two-thirds of the normal in plants of series 1.

WYCKOFF (R. W. G.). **Méthode pour la préparation des protéines par l'ultracentrifugation.** [A method for the preparation of proteins by ultracentrifugation.]—*C.R. Soc. Biol., Paris*, cxxv, 14, pp. 3–5, 1937.

A brief description is given of the construction and application of the ultracentrifuge used by the writer and his colleagues in the study of the tobacco mosaic virus, a note on which has already appeared from another source [*R.A.M.*, xvi, p. 638].

WYCKOFF (R. W. G.). **La préparation des virus-protéines par l'ultra-centrifugation.** [The preparation of virus proteins by ultracentrifugation.]—*C.R. Soc. Biol., Paris*, cxxv, 14, pp. 5–7, 1937.

Certain recent developments in the analytical study of the ultra-centrifuged tobacco mosaic virus protein are briefly traced [see preceding abstract], and some observations are made on the extension of the investigations to an animal virus (infectious papilloma of the rabbit), and on the general interest of the problems under consideration.

MCINTOSH (J.) & SELBIE (F. R.). **The measurement of the size of viruses by high-speed centrifugalization.**—*Brit. J. exp. Path.*, xviii, 2, pp. 162–174, 1 pl., 2 figs., 3 diags., 3 graphs, 1937.

Details are given of the construction of an air-driven centrifuge devised at the Bland-Sutton Institute of Pathology, Middlesex Hospital, London, W. 1, for the sedimentation of viruses and bacteria [cf. preceding abstracts]; it is capable of speeds of over 60,000 revolutions per minute and runs smoothly at a constant temperature. The sedimentation rates of various bodies and viruses can be expressed graphically and show a 'sedimentation angle', to the square root of the tangent of which the size of the particles [*R.A.M.*, xv, p. 672] has been shown to be proportional. From the data obtained a simplified formula, essentially similar to that of Stokes, has been established for the determination of the actual size of the particles calculable by means of this apparatus.

PARK (M.) & FERNANDO (M.). **Some studies on Tobacco diseases in Ceylon. II. Field spraying against frog-eye (Cercospora nicotianae E. & E.).**—*Trop. Agriculturist*, lxxxviii, 5, pp. 266–282, 1937.

Subsequent examination of transplanted tobacco sprayed with colloidal copper in the nursery showed that only the first leaves, which were removed at the first priming, were protected against frog eye (*Cercospora nicotianae*) [*R.A.M.*, xvi, p. 566], and control did not extend to later infection.

In a preliminary test, with the object of finding if effective and economic control could be obtained by a single spraying of plants in the field, plants treated in the nursery as previously described [loc. cit.], with suitable controls, were sprayed with a mixture composed of bouisol 1 oz., agral No. 2 $\frac{1}{16}$ oz., per gall. of water, on the 7th, 20th, and 26th January, 1937, 55, 74, and 99 days, respectively, after transplanting. The main crop was harvested 102 days after transplanting, and the results [which are shown in tabular form with full statistical data], are stated in terms of degree of freedom of the leaf from frog eye immediately before harvesting, and from frog eye and barn spot after curing.

The first and third sprayings were apparently too early and too late, respectively, to have any effect, but the second, applied at about the time of topping, gave excellent results, showing 486 'clean' (0 to 2 lesions) leaves out of a total of 760, as against 68/801 in the control plots, and 44/891 and 56/818 in the first and third sprayed plots, respectively; while in the cured leaf the second spraying gave 120 leaves with 0–25 lesions, 12 with 26–50, 5 with 51–100, and 3 with over 100, as against 1, 4, 11, 60 in the control, 0, 5, 6, 7 in the first spraying, and 5, 15, 19, 52 in the third spraying, respectively.

Spraying appeared to have no adverse effect, as judged by the cured leaf, and no scorching occurred. It was observed that heavy infection took place during dry weather, and it is concluded that high humidity is not necessary for infection.

TAYLOR (G. G.) & CHAMBERLAIN (E. E.). **Spotted-wilt on Tobacco.**—*N.Z. J. Agric.*, liv, 5, pp. 278–283, 4 figs., 1937.

Spotted wilt, reported in 1936 as known for some years on tomatoes in New Zealand [*R.A.M.*, xv, p. 324], has now been recorded on tobacco [ibid., xiii, p. 190; xvi, p. 134]. For the past four seasons it has been present in Auckland and the Bay of Plenty districts, where it has been known as 'black wilt', and in the latter district caused a loss of 25 per cent. of the crop in the 1932–3 season. In 1934–5 and 1935–6 it appeared in experimental plantings at Palmerston North. Diseased plants rarely yield any curable leaves, and become infected too late in the season for replacement.

Cross-inoculations from and to tomato and tobacco by the leaf-rubbing method produced identical symptoms in each case, and it is concluded that the same virus is responsible for both diseases. *Thrips tabaci*, identified as the vector elsewhere [ibid., xiv, pp. 404, 610, 763], commonly occurs in New Zealand, where preliminary experiments have shown that it is responsible for the transmission of the disease. It is also probable that some infection is occasioned by handling. The virus probably overwinters in annuals which grow through the winter or perennials, such as dahlias, or potatoes.

Recommendations for control comprise regular examination and roguing (applied also to neighbouring tomatoes), the diseased plants being burned or buried; washing the hands after handling diseased plants; and ploughing out volunteers.

WILSON (J. D.) & RUNNELS (H. A.). **The effect of various spray materials on Tomato transplants.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 185, pp. 58–65, 3 figs., 1937.

Continuing their studies on the effect of various sprays on tomato plants [*R.A.M.*, xvi, p. 420], the authors describe further experiments in which tomatoes of the usual size for transplanting were sprayed shortly before removal from the seedling flat, and then at 1- to 7-day intervals after.

Spray applications of Bordeaux mixture (4–4–50) were highly injurious, causing the death of many plants transplanted immediately after treatment. On the other hand, the plants treated with Volck concentrate (1 in 100) showed little injury, and the addition of this material to the Bordeaux mixture greatly reduced the damage caused by the latter. Most of the materials capable of increasing transpiration caused injury when the sprayed plants were removed as soon as the leaves were dry, though copper oxychloride and cuprous oxide caused only negligible injury when spraying was delayed until 48 hours after removal from the flat. Bordeaux mixture produced little ill effect when 5 days elapsed between spraying and transplanting to the field.

It is concluded that Bordeaux mixture should not be used on tomato plants in the seed-bed less than 5 days before transplanting, or on newly

transplanted tomatoes, especially if the soil is low in moisture. An interval of 2 or 3 days suffices if copper oxychloride or cuprous oxide is used.

KOTTE (W.). **Die Farn- oder Fadenblättrigkeit der Tomate.** [Fern or thread leaf of the Tomato.]—*Z. PflKrankh.*, xlvii, 2, pp. 65–72, 8 figs., 1937.

Outdoor tomatoes of the Augusta, Gross-Umstadter, and Stonor's M.P. varieties were observed in July, 1936, to be suffering from fern leaf [*R.A.M.*, xvi, p. 639] in several Baden nurseries, where fruit production was entirely inhibited from the onset of the disease [the symptoms of which are briefly described in the light of contemporary researches and control measures indicated]. During the period covered by the local inspections the weather was abnormally cold, wet, and dull, and these conditions probably occasioned the development of the disease which had hitherto passed unnoticed in the district. The introduction of the virus on Stonor's M.P. seed, imported from England three years earlier, is a possibility.

VERRALL (A. F.). **Variation in Fomes igniarius (L.) Gill.**—*Tech. Bull. Minn. agric. Exp. Sta.* 117, 41 pp., 12 figs., 2 graphs, 1937.

It is evident from a perusal of the relevant literature that the taxonomic separation of the variety *nigricans* from the typical *Fomes igniarius* [*R.A.M.*, xii, p. 543; xvi, p. 137] rests on an obscure and uncertain basis. From the morphological and cultural characters of collections of *F. igniarius* made in eight localities in Minnesota and one in Colorado from 1931 to 1933, three groups appear to be distinguishable, one limited to aspen (*Populus tremuloides* and *P. grandidentata*) [ibid., xiii, p. 604], a second to birch (mainly *Betula papyrifera* but also occurring on *B. lutea*) [loc. cit.], and a third associated with miscellaneous hosts, including *B. lutea*, *Ostrya virginiana*, *Carya cordiformis*, and *Juglans cinerea*. The sporophores of group (1) are relatively small, with the pore surface often at a wide angle from the horizontal; those of (2) larger, more applanate, with a fairly smooth upper surface; while the fruit bodies of (3) resemble those of (1) except in their more ungulate shape and rimose tops. With few exceptions, the pore diameters of (1) and (2) are similar (100·8 and 102·9 μ, respectively), that of (3) being much larger (149·2 μ), the setae of (1) are longer (15·8 μ) than those of the other two groups (13·4 and 13·1 μ), and the hyphae of (1) are larger (4·45 μ in diameter) than those of (2) and (3), measuring 3·19 and 3·18 μ, respectively.

In malt agar cultures the aspen group (1) is characterized by a distinctive methyl salicylate odour and comparatively slow growth, (2) develops fairly rapidly, and (3) commonly produces thick, dense tufts at the centre of ageing cultures. There are further innumerable variations involving antagonistic reactions between all isolates originating from different mycelia. The optimum temperature (27·5° C.) was found to be about the same for all three groups, this figure being considerably lower than the estimate (30°) of previous workers; the minimum and maximum are below 2° to 4° and about 40°, respectively.

The results of decay tests showed that only one of the aspen isolates

(A 13) differed appreciably from the rest in its capacity to disintegrate aspen wood, which was very slight in comparison with the other strains. On *B. papyrifera* and red gum (*Liquidambar styraciflua*), however, the disparities were more marked, the aspen isolates being in general slow, the white birch fast, and those from miscellaneous hosts intermediate in their decomposition rates.

F. igniarius appears to be heterothallic, four, two, and three sex groups being comprised within the white birch, *O. virginiana*, and aspen haploid cultures, respectively. Haploid cultures are slower in growth and in their action on wood than the dicaryotic tissue cultures of the parent fruiting bodies. No sexual fusions between the three groups were observed.

The growth of the aspen isolates on malt agar was totally inhibited by concentrations of 0·08 to 0·11 per cent. zinc chloride, the corresponding figures for those from white birch and miscellaneous trees being 0·14 or slightly above and 0·14 to 0·21 per cent., respectively.

MACDONALD (J. A.). **A study of Polyporus betulinus (Bull.) Fries.**—*Ann. appl. Biol.*, xxiv, 2, pp. 289–310, 2 pl., 22 figs., 1937.

In this study on *Polyporus betulinus* [*R.A.M.*, xiii, p. 604], prevalent on birch in Scotland, the author was unable to secure infections in his inoculation experiments but nevertheless concludes, from field observations, that the organism is a wound parasite. The type of breakdown caused by the fungus is a red-brown cubical rot affecting both the sap- and heartwood. The fungus secretes at least eight ferments including some capable of attacking lignin. Cultural criteria, on the lines of [Clara W.] Fritz [*R.A.M.*, iii, p. 490], are described which place the fungus in the same group as *Poria subacida*. Black lines, representing the wall of a resting body, are formed in culture, together with small, light brown, roughly spherical sclerotium-like bodies termed bulbils. Details are given of the fertile sporophore and the nuclear phenomena in the basidium. The fungus is heterothallic, and monosporous mycelia bear no clamp-connexions.

HEPTING (G. H.) & HEDGCOCK (G. G.). **Decay in merchantable Oak, Yellow Poplar, and Basswood in the Appalachian region.**—*Tech. Bull. U.S. Dep. Agric.* 570, 30 pp., 6 graphs, 1 map, 1937.

An investigation into the decay situation in standing hardwood trees of merchantable size and condition in the Appalachian region of the United States showed that the commonest fungi causing decay on oak (*Quercus alba*, *Q. montana*, *Q. stellata*, *Q. borealis*, *Q. borealis maxima*, *Q. velutina*, *Q. coccinea*) were *Polyporus sulphureus* [*R.A.M.*, xvi, p. 358], *P. spraguei* [ibid., xi, p. 275], *Hydnum erinaceus* [ibid., xv, p. 470], and *Armillaria mellea* [ibid., xvi, p. 564]. On yellow poplar (or tulip tree: *Liriodendron tulipifera*) decay was associated with *Pleurotus ostreatus* [loc. cit.], *H. erinaceus*, *A. mellea*, and *Hypholoma* sp., and on basswood (*Tilia* spp.) with *Pholiota adiposa* [ibid., xv, p. 72; xvi, p. 292].

Of the total cull volume 77, 20, and 3 per cent., respectively, was due to butt defect, top rot, and miscellaneous defects, decay causing more defect than any other factor. Cull per cent. increased with tree diameter and tree age. The height of butt rot increased with tree age up to a

certain point and a curvilinear relation was established between the average diameter of rot and the length of the rot column, though there was considerable individual variation.

Of the trees examined 47·1, 0·6, and 1·5 per cent., respectively, had wounds caused by fire, lightning, and other factors. Only 6 per cent. of the trees without basal wounds showed butt rot, with 1·5 per cent. cull, while of those with basal wounds 67 per cent. showed butt rot, with 15·5 per cent. cull. Butt-cull volume increased with width of basal wound and with tree age at time of wounding.

HIRANE (S.). **Studies on the parasitism of the rust of Acacia confusa Merrill, Maravalia hyalospora (Saw.) Diet. I. Reaction to the rust of maturity of phyllodes.**—*Trans. nat. Hist. Soc. Formosa*, xxvii, pp. 69–89, 3 figs., 1937. [Japanese, with English summary.]

The results of inoculation tests under controlled conditions with *Maravalia hyalospora* [*R.A.M.*, xiv, p. 611] on potted *Acacia confusa* plants indicated that temperature is a decisive factor in the reaction of the host to infection by the rust, which assumes a very severe form in the spring and autumn at temperature ranges of 17° to 24° and 20° to 26·5° C., respectively, while in the winter (13° to 18·5°) the damage is milder, and in the summer (23·5° to 32°) negligible. The minimum, optimum, and maximum temperatures for uredo- and teleutospore germination were found to lie between 9° and 13°, 22° and 25°, and 31° and 34°, respectively. Teleutospore infection is generally restricted to the very young phyllodes, viz., the first and second from the tops of the young twigs and occasionally the young (apical) portion of the third phyllode, being barely perceptible on the older ones (third to sixth), whereas in the case of the uredospores these relations are reversed. The uredospore germ-tubes usually produce amoeba-like appressoria in the susceptible phyllode areas: these organs are rudimentary or absent on the resistant and immune portions, suggesting the secretion by the young phyllode tissues of some substance stimulating appressorial formation.

COLE (J. R.). **Bunch disease of Pecans.**—*Phytopathology*, xxvii, 5, pp. 604–612, 4 figs., 1937.

In this expanded account of the bunch disease of pecans (*Hicoria* [*Carya*] *pecan*), a preliminary note on which has already appeared [*R.A.M.*, xvi, p. 506], the writer points out the close resemblance of certain symptoms of the new disorder to rosette of the same host [ibid., xvi, p. 73] and its similarity in some characters with little leaf of pecans [ibid., xiv, p. 768; cf. above, p. 682], phony peach and peach yellows [ibid., xvi, pp. 329, 621], and witches' broom of black locust (*Robinia pseud-acacia*) [ibid., xiv, p. 462]. Water hickory (*H.* [*C.*] *aquatica*) is also liable to the trouble.

GÄUMANN (E.) & JAAG (O.). **Über eine neue Erkrankung der Tanne (Abies alba Hill.) und der Fichte (Picea excelsa [Lam.] Link.).** [On a new disease of the Fir (*Abies alba* Mill.) and of the Spruce (*Picea excelsa* [Lam.] Link.).]—*Phytopath. Z.*, x, 1, pp. 1–16, 18 figs., 1 graph, 1937.

Firs (*Abies alba*) and spruces (*Picea excelsa*) planted on heavy diluvial

macadam and clay soil in a reafforestation area of the Emmental, Switzerland, 900 to 1,100 m. above sea-level, in the '70's of last century have sustained severe damage during the past decade from a disease characterized by ill-defined, flat, striate cortical depression, mostly extending from the butt upwards to the crown but sometimes confined to the upper part of the tree, and occasionally accompanied by an outflow of resin. Within a few years the sunken areas, numbering up to about two dozen, eat deeply into the stem, the hollowed cortex becoming desiccated and tending to rupture; eventually the individual fissures unite, the entire trunk bursts open, and at this stage the trees resemble those suffering from old, neglected frost cracks. The upward growth of the affected trees is arrested and the leader-shoot dies, so that a 'stork's nest' aspect is assumed by the crown.

The causal organism of the disease, *Pleurotus mitis*, is described and its effects on the internal tissues of the hosts discussed. The symptoms generally resemble those of the red rot associated with the honey fungus [*Armillaria mellea*] and involve the cambium and xylem, where its striate development corresponds to the above-mentioned depressions on the cortex. *P. mitis* is a virulent pathogen, arresting the incremental growth of the trees and causing widespread disintegration of the tissues.

The minimum, optimum, and maximum temperatures for the development of the fungus in malt agar cultures were found to be under 3°, 15° to 24°, and 27° to 30° C., respectively.

Positive results were given by inoculation experiments *in situ* with the mycelium of *P. mitis* on eight 30- to 35-year-old firs, six spruces of a similar age, and two 15-year-old white pines (*Pinus strobus*), whereas *P. cembra* and *Pseudotsuga douglasii* [*P. taxifolia*] failed to contract the disease. The symptoms were most intense on *A. alba*, the woody tissues of which surrounding the site of inoculation were found, after a period of two years and four to five months, to be completely destroyed by a red or wet rot.

[An abridged account of these investigations appears in *Schweiz Z. Forstw.*, lxxxviii, 6, pp. 145–151, 2 pl., 1937.]

HANSEN (H. N.) & SMITH (R. E.). **A bacterial gall disease of Douglas fir, Pseudotsuga taxifolia.**—*Hilgardia*, x, 14, pp. 569–577, 4 figs., 1937.

In this full account of their studies on the bacterial gall disease of Douglas fir (*Pseudotsuga taxifolia*) [*R.A.M.*, xiii, p. 1] the authors state that the disease is commonly observed in marginal localities for the growth of the Douglas fir in California where the tree is practically worthless for timber production but has economic importance as an ornamental. In the course of inoculation experiments it became evident that the pathogen can remain in the host for nearly a year before galls begin to appear, and that gall formation is limited to the active period of the host twig from late March to July; furthermore the organism appears to find it relatively difficult to establish itself during late summer. The fact that actual contact between the pathogen and the xylem of the host is apparently essential to gall formation indicates transmission of the disease by insects, among which *Chermes cooleyi* is probably the vector, since it was observed to feed on the galls and three

galls were definitely traced to wounds produced by this insect. Evidence is adduced that the pathogen is highly specific to the Douglas fir. On cultural, morphological, and physiological bases the organism is considered to be distinct from known species and is accordingly named *Bacterium pseudotsugae.* It is a non-motile rod, with rounded ends, non-sporing, Gram-negative, non-acid-fast, liquefies gelatine, produces slight hydrogen sulphide, reduces nitrates, forms no acid in milk, produces no ammonia, no acid or gas in lactose, sucrose, or glycerine, but produces acid without gas in glucose, levulose, galactose, and maltose; starch is not hydrolysed.

Steiner (H.). **Adelopus balsamicola (Peck) Theiss. f. Douglasii als Erreger einer Schütteerkrankung der Douglastanne.** [*Adelopus balsamicola* (Peck) Theiss. f. *douglasii* as the agent of a needle-fall disease of the Douglas Fir.]—*Z. PflKrankh.*, xlvii, 3, pp. 164–186, 13 figs., 1 map, 1937.

Following an introductory sketch of the Douglas fir (*Pseudotsuga taxifolia* and vars.) in its original home (North America) and of its silvicultural possibilities and liability to parasitic diseases in Europe, the author describes the geographical distribution of the *Adelopus* needle fall disease (*A. balsamicola*) [*R.A.M.*, xvi, p. 507], with special reference to its occurrence in Austria, where it was first observed in the Feldkirch district of Vorarlberg at an altitude of 500 m. above sea-level, having presumably been introduced either with seedlings from Germany or by means of spores from Switzerland.

Comparative microscopic studies of Austrian material of the fungus on *P. taxifolia* and *Abies balsamea* revealed no differences between the asci and ascospores on the two hosts, but the perithecia of the strain on the former were more or less rounded, 55 to 70 μ in diameter and 46 to 58 μ in height, the basal portion tapering down into a stalk 8·5 to 16 μ long, filling the substomatal chamber. These peculiarities, due to anatomical features of the host, serve to distinguish the strain of *Adelopus balsamicola* on *P. taxifolia* from the recognized form on *Abies balsamea*, with applanate-globose to elliptical perithecia, furnished with a stalk 30 to 43 μ in length, arising from a definite basal plate and the former is accordingly named *Adelopus balsamicola* f. *douglasii* n. f., with a Latin diagnosis.

[A condensed account of these researches appears in *Silva*, xxv, 25, pp. 189–191, 1937.]

Macrae (Ruth). **Interfertility phenomena of the American and European forms of Panus stypticus (Bull.) Fries.**—*Nature, Lond.*, cxxxix, p. 674, 1937.

Although morphologically alike, American and European forms of *Panus stipticus* [*R.A.M.*, ix, p. 216; xi, p. 497; xiv, p. 270] differ in that the former is luminous and the latter non-luminous. By pairing monosporous cultures both forms were found to be heterothallic, tetrapolar, and completely interfertile. In 64 pairings of the two forms the F_1 diploid mycelium produced has been found to be luminous, showing that luminosity is dominant.

PEARSON (O. H.). **The effect of various dusts upon the rate of seeding of various vegetable seeds.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 559–561, 1937.

When spinach, kohlrabi, Chinese cabbage [*Brassica pekinensis*], radish, lettuce, carrot, beet, tomato, parsnip, celery, and pea seed dusted with cuprous oxide or zinc oxide was planted by a gravity flow equipment machine, the seeding rate was increased or decreased by up to 23 per cent., the amount and direction of the difference apparently being correlated with the smoothness or roughness of the seed surface and its density. The seeding rate was retarded for smooth-coated seeds and accelerated for rough-coated ones. The addition of graphite [*R.A.M.*, xv, p. 552] to the dusts reduced the seeding rate of carrot and lettuce seed, but increased that of the smooth-coated types and wrinkled peas, though this effect cannot be as closely correlated with the seed-coat type as when dust alone is used. Growers are cautioned to adjust planting machines to a normal rate of seeding.

EZERSKAYA (Mme E. I.). Хлорпикрин как дезинфектор почвы в парниках. [Chloropicrin as soil disinfectant in hot frames.]—*Pl. Prot., Leningr., 1937*, 12, pp. 113–120, 1937.

Details are given of experiments in 1935 and 1936 in two Ukrainian stations, the results of which confirmed those described by Masslovski [*R.A.M.*, xvi, p. 293] concerning the efficacy of chloropicrin in the control of black leg (*Moniliopsis aderholdi*, in association with *Fusarium* and *Botrytis* spp.) of cabbage seedlings in hot frames. Watering the frames with 40 to 80 gm. chloropicrin reduced the incidence of the disease from 10 to 35 per cent. in the control frames to 0·3 to 1 per cent. in the treated frames.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xi, 5, pp. 90, 96–97, 1937.

COLOMBIA. A Decree of 16th December, 1936, prohibits the importation of sugar-cane seed from foreign countries with a view to the exclusion from the Republic of diseases [see above, p. 711] and pests, exceptions being made, however, in favour of the two Porto Rican Experiment Stations at Mayaguez and Río Piedras and the Bureau of Plant Industry, United States Department of Agriculture, consignments from which must be accompanied by official health certificates.

LUXEMBURG (Grand Duchy of). Under the terms of a Decree of 18th July, 1936, potato tubers and tomato and eggplant fruits imported into Luxemburg must be accompanied by duly authenticated certificates vouching for the absence from the place of origin and from a surrounding radius exceeding 5 km. of wart disease (*Synchytrium endobioticum*) [*R.A.M.*, iii, p. 559; xv, p. 752].

UNION ISLANDS. In virtue of the Union Islands Plant Protection Ordinance of 18th November, 1936 (effective as from 1st December), all plants or parts thereof, fruits, or soil are debarred from entry into the Union (Gilbert and Ellice) Islands except by a written permit of an Inspector or District Officer.

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IMŠENECKI [IMSHENETZKI] (A. A.) & NAZAROVA (Mme E. S.). О действии ультракоротких волн на грибы, разрушающие древесину (**Merulius lacrymans Schum.** и **Poria vaporaria Pers.**). [The action of ultra-short waves on wood-destroying fungi (*Merulius lacrymans* Schum. and *Poria vaporaria* Pers.).]—*Bull. Acad. Sci. U.R.S.S., (Sér. biol.), 1937*, 1, pp. 221–230, 1 fig., 1937. [English summary.]

It was experimentally shown by the authors that exposure for 40 to 60 mins. to irradiation by ultra-short waves (length 4·5 m., generated by a 500 volts WK lamp, on a 30 to 45 milliamp. anode, of calibre 504×10^8 ergs) completely killed pure cultures of *Merulius lacrymans* and *Poria vaporaria* [*R.A.M.*, xvi, p. 429] on sawdust, enclosed in paper wrappers, the lethal action being independent of the mass of the samples of infected sawdust exposed (3 gm. and 112 gm.). The killing effect of the waves was even more rapid when the cultures were enclosed inside 5 cm.-thick wood blocks, but glass appeared to arrest the waves in direct relation to its thickness. Two- to three-month-old cultures were more resistant than those below 15 days or over 3½ months in age. Sub-lethal doses of the waves inhibited the germination of *M. lacrymans* and *P. vaporaria* spores on fresh media, and considerably slowed down the growth of their mycelia, besides causing morphological changes in the hyphae, which persisted for a long time in subcultures from the irradiated cultures. These results lead the authors to believe that the sterilization of structural and other timber by ultra-short waves is a practical possibility, provided these waves are experimentally shown not to have a detrimental effect on the physical properties of wood.

WAGER (V. A.). **Black-rot disease of Cabbages.**—*Fmg S. Afr.*, xii, 133, pp. 170–171, 4 figs., 1937.

A popular account is given of black rot of cabbages (*Bacterium campestre*) [*Pseudomonas campestris*: *R.A.M.*, xv, p. 335] which is often epidemic in South Africa, wiping out large plantings. The disease is commonly spread by infected seed and since most of the seed sown in South Africa is imported, usually without any guarantee that it comes from a healthy stock, the author recommends that all seed should be sterilized by steeping in mercuric chloride (1 in 1,000) for 20 to 30 minutes. Seed-beds should be situated on high ground to avoid

drainage from infected land, and if not in virgin soil the bed should be sterilized by making a fire on it prior to sowing.

DEARBORN (C. H.), THOMPSON (H. C.), & RALEIGH (G. J.). **Cauliflower browning resulting from a deficiency of boron.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 483–487, 1937.

In further investigations into the browning of cauliflowers prevalent in New York State [*R.A.M.*, xv, p. 769], a greenhouse test was carried out in which 60 Super Snowball cauliflower plants were grown in pots in Lackawanna silt loam, to which was applied a 4–8–7 fertilizer at the rate of 1 ton per acre, and borax at rates ranging from 2·5 to 25 lb. per acre, one series of pots receiving no borax. At maturity all the controls (without borax) showed severe browning and had the characteristic bitterness; 4 out of 10 of the plants given borax at the rate of 2·5 lb. per acre showed light internal but no external discoloration, while only 2 out of 10 of those given borax at 5 lb. per acre showed minute, brown spots inside the apical part of the stem. No discoloration developed in any of the plants to which borax was applied at 7·5, 15, or 25 lb. per acre.

In a subsequent field experiment plots on two types of soil (Lackawanna and Culvers silt loam) were given four treatments, viz., no borax, and borax at the rate of 5, 10, and 25 lb. per acre, each in addition to 4–8–7 fertilizer. At maturity the treatments on the first type of soil gave, respectively, 24·4, 1·3, 0·5, and 0 per cent. browning, the corresponding figures on the second soil being 49·3, 0, 0, and 0 per cent.

Tests and observations on a number of farms showed that in all cases where borax was applied at the rate of 6 lb. or more per acre (even after the heads had begun to form) the condition was controlled, except where the borax was mixed with hydrated lime.

SNYDER (G. B.) & DONALDSON (R. W.). **The use of borax in controlling dark center of Turnips.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 480–482, 1937.

After briefly describing the symptoms of 'dark centre' or brown heart of swedes [*R.A.M.*, xvi, p. 649], and pointing out that the true turnip does not show the water-soaked areas in the parenchyma tissue characteristic of the condition in swedes, but becomes pithy or punky, the authors state that 5 years' observations in different parts of Massachusetts showed that the disease occurred on all types of soil. Where seaweed was used in large quantities in pit storage in the field, the roots of plants growing immediately over the pits the following year were relatively clean. Clean roots frequently occurred on raw subsoil brought to the surface during the previous year's pitting. Plants grown on soil where manure had been heaped produced perfectly clean roots. Field trials indicated that the condition can be controlled by borax applications of 10 to 20 lb. per acre as powder or spray if applied to the drill; when broadcast 20 to 30 lb. per acre should be used.

OSBORN (H. T.). **Studies on the transmission of Pea virus 2 by aphids.**—*Phytopathology*, xxvii, 5, pp. 589–603, 4 figs., 1937.

Pea virus 2 [*R.A.M.*, xvi, p. 583 and cf. ibid., xvi, p. 650] was trans-

mitted by mechanical inoculation from broad beans (*Vicia faba*) to Telephone and Alderman peas, field peas, sweet peas, crimson and red clovers (*Trifolium incarnatum* and *T. pratense*), white sweet clover (*Melilotus alba*), and Green Stringless Refugee, Corbett Refugee, and Robust garden beans (*Phaseolus vulgaris*), and retransferred from each of these hosts to *V. faba*. It was further conveyed from *V. faba* to peas (garden and field) and Green Stringless Refugee beans by means of the pea aphid (*Macrosiphum pisi*), which also acted as a carrier of infection from red clover to broad beans. Wisconsin Resistant Perfection peas and Great Northern Idaho No. 1 beans reacted negatively to inoculation with pea virus 2. The virus was inactivated by 10 minutes' exposure to a temperature of 64° C. and by 5 days' ageing *in vitro*. It was transmitted in 5 minutes by both nymphs and adults, and by single insects of *M. pisi*, *M. gei* [*M. solanifolii*], and *Aphis rumicis* from diseased to healthy *V. faba* plants following a 5-minute feeding period. Some colonies lost the virus when held for 15 minutes on healthy plants, and all three species of insect did so when allowed to feed continuously for one hour on healthy plants. When held without access to food, *A. rumicis* retained pea virus 2 for 5 hours, *M. pisi* for 8, and *M. solanifolii* in one case for 24. No incubation period of the virus was observed in colonies of these insects fed for one day on diseased plants and transferred to a succession of healthy ones for a total period of 14 days.

WILSON (A. R.). **The chocolate spot disease of Beans (Vicia faba L.) caused by Botrytis cinerea Pers.**—*Ann. appl. Biol.*, xxiv, 2, pp. 258–288, 2 pl., 3 figs., 1937.

Experimental data having excluded bacterial and virus agents as the cause of chocolate spot of beans (*Vicia faba*) [*R.A.M.*, xiv, p. 734; xvi, p. 651] in Britain, a series of inoculations were carried out with a strain of *Botrytis cinerea* (B.S. 501) isolated at Cambridge in 1932. Upwards of 500 bean plants were successfully infected under greenhouse conditions, the inoculated plants being placed in water under bell jars for the first 48 hours, and the fungus being re-isolated from artificially affected plants. Field experiments confirmed this result.

Two types of infection by *B. cinerea* were observed, 'aggressive' causing blackening and death of the shoot system, and 'non-aggressive' causing discrete, chocolate-coloured lesions; the former is responsible for most of the loss caused by epidemic outbreaks of the disease. On plants kept under suitable conditions for infection there was a progressive increase in the total number of visible lesions over a period of at least 5 days from the application of the spore suspension, a dilute suspension leading to non-aggressive infection and a dense suspension to aggressive infection. If the plants treated with the heavy suspension were removed after 24 hours to a humidity unsuitable for infection the attack remained non-aggressive. Mycelium was abundant in lesions of the aggressive type but occurred only sparsely in non-aggressive infections.

The maximum temperature for infection is about 30° C., the optimum about 20°, and the minimum between +1° and −1°. Evidence is adduced that a film of water is essential for infection, and any factors

increasing evaporation tend to inhibit or decrease infection. Data are presented showing that the optimum conditions for aggressive infection are (*a*) the presence of large numbers of spores on the foliage, (*b*) rain to provide a water film, (*c*) a high humidity and rain to maintain the film for some days, (*d*) little or no wind or sun to increase evaporation, and (*e*) an air temperature between 15° and 20°. The relationship between rainfall and the severity of chocolate spot was statistically established, epidemics being correlated with abnormally heavy rainfall during the critical months of April, May, June, and July. Experiments showed that spores of *B. cinerea* are capable of retaining their viability over long periods (more than a month) of adverse conditions. Any factor tending to weaken the crop, such as acid soil, deficiency of potash [ibid., xv, p. 698] or phosphate, and waterlogging of the soil, renders it more liable to aggressive infection, while shelter from the prevailing wind and a dense stand also favour the disease.

No satisfactory method of control has yet been found, but the likelihood of an epidemic is lessened if the predisposing soil factors are corrected. Spring-sown beans have manifested reduced liability to attack but are more readily infested by *Aphis rumicis*.

The pathogenicity of *B. cinerea* to a number of leguminous plants was established, but the only species showing such severe symptoms as *V. faba* was *V. sativa*. Sainfoin (*Onobrychis sativa*) showed slight chocolate spotting.

A comparison of *B. cinerea* with other species of *Botrytis* capable of causing chocolate spot, including *B. fabae* Sard. [ibid., ix, p. 424], *B. fabae* Ikata [ibid., xiii, p. 741] (neither of which superficially resembles *B. cinerea* strain B.S. 501), and Brierley's albino strain of *B. cinerea*, showed that all forms of *B. cinerea* and other species of *Botrytis* are capable of causing chocolate spot lesions. The disease in Britain is probably caused by many forms belonging to the group species *B. cinerea*.

[A popular account of this investigation is published in *J. Minist. Agric.*, xliii, 11, pp. 1047–1049, 1 pl., 1937.]

Bremer (H.). **Über die bisher fälschlich 'Zwiebelrotz' genannte Gelbstreifigkeit an Zwiebelsamenträgern.** [On the yellow streakiness of Onion seed-bearers hitherto wrongly designated 'Onion slime'.]—*Phytopath. Z.*, x, 1, pp. 79–105, 5 figs., 1937.

The onion trouble hitherto designated as 'slime disease' ('Rotzkrankheit') [*R.A.M.*, xiv, p. 553] would be more appropriately described as 'yellow streakiness', and the adoption of the latter name is therefore proposed. The disorder appears from comparative studies to be identical with the American 'yellow dwarf' [ibid., xv, p. 486], but actual evidence of the transmissibility of the German disease by insects is still incomplete.

The symptoms of the disease in seed-bearers include undulation, contortion, drooping, and a yellowish-green, mostly definitely striate discoloration of the leaf blades, the last-named feature also affecting the inflorescence axes (seed-bearers), the development of which is strongly impeded. Flower-setting and seed production are severely impaired, yield reductions of 51, 44, and 69 per cent. having been reported in 1929, 1932, and 1933, respectively, at the Aschersleben branch of the

Biological Institute. Although yellow streakiness is primarily a disease of the seed-bearers, non-flowering first-year plants may also be affected, commencing in the height of summer or in the autumn with a thickening of the collar which obliterates the normal sharp line of demarcation between the bulb and the foliage. Such bulbs do not mature properly and are very liable to storage rots; they tend to sprout abnormally early. The disturbance in the metabolic processes of yellow-streaked plants is reflected in the insipidity of the onions. The incidence of infection is particularly high in certain districts where intensive onion cultivation is practised, and is increased by late planting and wide spacing. Yellow streakiness has been observed in the field on leeks. The disease is not transmissible by the seed. The results of insect transmission experiments, though not, as stated above, affording irrefutable evidence of this means of conveyance, certainly point to the implication of thrips and aphids, 99 and 100 per cent., respectively, of the plants infected through which in one test contracted yellow streak symptoms compared with 23 per cent. in the controls.

The few cases of spontaneous recovery from yellow streakiness are without economic importance, and steps should be taken to combat the disease by the isolation of one- and two-year-old seed-bearer fields, the use for seed only of small, firm, late sprouting onions, and the rigorous elimination of infected plants from the field and of diseased bulbs from storage.

Cayley (Dorothy M.). **Experimental spawn and Mushroom cultures. I.** —*Ann. appl. Biol.*, xxiv, 2, pp. 311–322, 3 pl., 1937.

In comparative cultural studies on wild and cultivated mushrooms [*R.A.M.*, xvi, p. 365] the author found that the wild field mushroom (*Psalliota campestris*) and the horse mushrooms (*P. arvensis*) failed to grow on stable manure compost, fermented for 14 days or more, but grew quite freely on unfermented composts (comprising chopped straw, hay, and sand in varying proportions plus nutrient solution). The wild haystack mushroom (*P.* sp. intermediate between the foregoing, and with four-spored basidia) also refused to grow on stable manure compost, but tolerated the by-products of 14 days' fermentation at a high temperature. The cultivated varieties (comprising the fuscous, white, white fragrant, and honeymoon white varieties) grew on unfermented composts, on high temperature composts fermented up to 35 days, and on prolonged low temperature composts, showing varietal differences on the last-named. The results showed a definite sequence in physiological behaviour from the low facultative saprophytism of the two wild grassland species to the high saprophytism of the cultivated forms, the wild haystack mushroom being intermediate. As a result of numerous tests the following compost has been adopted for growing spawn of all the forms: 2 gm. each of dry chopped straw and dry chopped hay are mixed and moistened with 10 c.c. rain water, 2 gm. crushed oats and $\frac{1}{2}$ oz. coarse sand (washed and dried) are then mixed in, the compost placed in a tube 8 by $1\frac{1}{2}$ in., lightly pressed down, a layer of dry sand placed on the surface, the whole moistened with 10 c.c. Styer's nutrient solution A (*Amer. J. Bot.*, xv, pp. 246–250, 1928) [$MgSO_4$ 0·02M, K_2SO_4 0·01M, KH_2PO_4 0·04M, $CaCl_2$ 0·002M, $FeSO_4$ trace, NH_4NO_3 0·1M.

NaOH to bring P_H to 6·0] and sterilized on three successive days [*R.A.M.*, xiii, p. 491].

GOMEZ-MENOR (O.). **Notas fitopatológicas.** [Phytopathological notes.] —*Rev. Agric., S. Domingo*, xxviii, 91, pp. 170–172, 3 figs., 1937.

In addition to the well-known cassava diseases caused by *Gloeosporium manihotis* [*R.A.M.*, xii, p. 680] and *Cercospora henningsii* [ibid., xv, p. 280], a case of rust (*Uromyces jatrophae*) has been observed on the crop in one locality of the Dominican Republic. Bordeaux mixture is recommended for the control of the last-named disease.

WILLIAMS (P. H.), ORCHARD (O. B.), WHITE (H. L.), OYLER (E.), AINSWORTH (G. C.), & READ (W. H.). **Plant diseases.**—*Rep. exp. Res. Sta., Cheshunt, 1936*, pp. 40–69, 1937.

In investigations on rose rust [*Phragmidium* sp. *R.A.M.*, xv, p. 653] by P. H. Williams (pp. 41–43) the results of cross inoculations with strains of the rust from briars (*Rosa canina*) confirmed those previously obtained. Overwintered teleutospores from the rose germinated successfully on 2nd June, when floated on distilled water. Inoculations with teleutospores were not successful, but leaves bearing the aecidial stage have been observed. Both the caeoma and uredospore stages are described.

O. B. Orchard (p. 43) reports that rose mildew (*Sphaerotheca pannosa*) was successfully controlled in a commercial nursery by bouisol-white-oil emulsion (now placed on the market) applied at the end of June and thereafter at intervals of three weeks. Slight spotting was caused by the mixture on fully open blooms.

P. H. Williams (pp. 45–46) gives an account of his investigation of the newly recorded invader of mushroom [*Psalliota* spp.] beds, *Pseudobalsamia microspora* [ibid., xvi, p. 86]. On pp. 46–48 he describes his studies on *Oospora fimicola* [ibid., xvi, p. 653] which caused severe injury in mushroom houses. The fungus was distinctly favoured by an alkaline medium, the growth per day at P_H 2·8 to 4·6, 5·0, 6·2, 7·2, and 7·6 being nil, 0·07, 0·258, 0·291, and 0·301 mm., respectively. Evidence was obtained that manure must be decomposed to a certain extent by composting before it is suitable for the growth of *O. fimicola*.

H. L. White (pp. 48–52) gives notes on control measures against the *Verticillium* wilt (*V. cinerescens*) of the perpetual flowering carnations, some of which have already been noted from another source [ibid., xvi, p. 183]. A mechanical barrier composed of bricks or drain pipes to prevent spread is not favoured, though a raised bench should secure a clean crop at first. A layer of lime laid carefully so as to remain unbroken, combined with sterilization or replacement of the top soil appears to promise successful results. The same author (pp. 52–54) discusses anther smut of carnations (*Ustilago violacea*) and states that measures recommended in his previous paper [ibid., xvi, p. 180] have resulted in the elimination of the disease from one nursery. After cutting blooms for market from an infected bed, infected buds should be systematically removed.

In further studies on crown rot of rhubarb in 1936, the author isolated *Bacterium rhaponticum* once from diseased material, 42 out of 57 isolations remaining sterile and 11 yielding bacterial colonies. An

irregular brownish network of vascular bundles, devoid of any associated organism was present in diseased plants, as well as extensive coffee-coloured areas characteristic of crown rot. It is suspected that bacteria are not solely responsible for the disease.

A serious attack of halo blight of glasshouse-grown runner beans [*Bacterium medicaginis* var. *phaseolicola*: ibid., xvi, p. 150] occurred during 1936, the relatively humid conditions favouring the disease. Germination of seed marked with lesions in 1935 was 80 per cent. compared with 88 per cent. for unmarked seed, the corresponding figures for 1936 being 88 and 98 per cent., respectively. Of the 1935 seedlings 4·2 per cent. were diseased compared with 9·7 per cent. for the 1936 seed. Plants placed under bell jars showed 44 per cent. affected by a marginal rot on the first leaves, and in 66 per cent. of these plants only the diagonally opposite margins of each of the first pair of leaves were affected, suggesting that infection occurred through the marginal water pores as the leaves pushed through the soil. Control of the disease is largely dependent on the provision of clean seed.

Glasshouse runner beans suffer appreciable losses from root and foot rots associated with *Fusarium martii* var. *phaseoli* [*F. solani* var. *martii* f. 3: ibid., xiv, p. 730], *Thielavia basicola*, *Botrytis* sp., or *Phytophthora* sp. Infection by *Botrytis* has been observed from decaying cotyledons which come to rest against the stem. Growers are recommended to remove the cotyledons before they touch the stem.

In tests of calcium hypochlorite as a disinfectant of tomato seed, over 98 per cent. of the treated seeds were completely sterile.

E. Oyler (pp. 58–59) records a species of *Phytophthora* resembling *P. parasitica* as the cause of a wilt of *Solanum capsicastrum* [ibid., xiv, p. 636] and verbena. The stems were brown at the nodes and the leaves arising from them were brown from the petioles upwards, the roots being healthy. Both tomato and *S. capsicastrum* were successfully inoculated through wounds, and it is thought that the outbreak was due to infection of injuries received in severe thunderstorms.

P. cryptogea caused a 'black neck' disease of marguerite [*Chrysanthemum frutescens*] in which the leaves of the whole or part of the plant wilted and the lower parts of the stems blackened, the roots showed a slight browning. The pathogenicity of the fungus was established in inoculation experiments.

G. C. Ainsworth (pp. 59—62) reports that during the year bushy stunt [ibid., xv, p. 757] of tomatoes was only recorded once and caused no appreciable damage; tomato enation mosaic reappeared in Lanarkshire and was also found in Sussex. Lettuce mosaic occurred at the Station and in a commercial nursery, where it affected both cos and cabbage varieties; the results of preliminary experiments indicated that only one virus was involved. By means of the sodium sulphite method [ibid., xv, p. 655] tomato spotted wilt was detected in several samples of chrysanthemums received during the year. Considerable differences were observed in the symptoms produced by the virus on different varieties of chrysanthemum: the Edwin Seidwitz variety developed ring and line patterns in the spring and indefinite, irregular mottling later, Romance showed symptoms resembling those of eelworm infection, and Friendly Rival yellowing of the veins in the upper leaves and

slight browning of the interveinal areas. Infected plants should not be used for propagating. Cucumber virus 1 was recorded on *Primula japonica* causing a serious mosaic. Mosaic or yellow stripe occurred on daffodils [*Narcissus pseudo-narcissus*] under glass, Golden Spur being very susceptible, and mosaic affected about 90 per cent. of Wedgwood bulbous iris plants raised from bulbs imported from Holland.

W. H. Read (pp. 64–69) describes a peculiar, sharply defined, circular spotting of tomato fruits, mostly on the upper halves, which he terms 'water spot' [cf. ibid., xvi, p. 421]. In size the spots vary from 0·5 to 3 mm. when first observed and rarely exceed 1 cm. diameter on the ripe fruit. It was found that the spots are only formed when spores are suspended on the fruit in minute drops. When *Botrytis cinerea* spores are added to larger drops a slightly raised or blister-like spot is formed lighter in colour than the remainder of the surface. Spraying with a suspension of spores of *Cladosporium fulvum* taken from tomato leaves induced the formation of spots within 9 days. The actual process of spot formation is obscure, but possibly the spots are due to the liberation of some toxic substance by the germinating *Botrytis* spores. Control lies in reducing the condensation of moisture and avoiding conditions favouring the growth of *Botrytis* and *Cladosporium*.

MARCHAL (E.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État, pendant l'année 1936.** [Observations and researches carried out at the State Phytopathological Station during the year 1936.]—*Bull. Inst. agron. Gembloux*, vi, 2, pp. 73–80, 1937. [Flemish, German, and English summaries.]

This report [cf. *R.A.M.*, xv, p. 775] contains among others the following items of phytopathological interest. Potatoes in Belgium were widely attacked by *Alternaria solani* [ibid., xv, p. 494] and were also affected by pseudo-net necrosis [ibid., xvi, p. 55], which was particularly prevalent on the Erdgold, Roode Star, and Furore varieties. The latter disease appears to be seed-borne, but in a rather irregular fashion, the symptoms varying greatly in intensity. Dwarf kidney beans [*Phaseolus vulgaris*] grown from seed imported from France were attacked in July 1936 by *Bacterium medicaginis* var. *phaseolicola* [see preceding abstract] not recorded hitherto in Belgium. The disease spread rapidly, but during August it became arrested, apparently as a result of drought. Tomato spotted wilt was more prevalent than formerly. Much damage was caused to ornamentals in glasshouses by *Hypochnus* [*Corticium*] *solani*, especially to species of *Asparagus*, *Araucaria*, *Azalea*, and *Begonia*. In establishments where one particular species of ornamental plant is grown on a large scale the disease may become endemic; in such a case new soil should be used and all appliances disinfected. *Marssonina daphnes* [ibid., xiv, p. 585] was found on *Daphne mezereum*. Cherry trees in several localities were attacked by *V*[*enturia*] *cerasi*, which is becoming increasingly prevalent in Belgium.

STELL (F.). **Report of Mycologist, 1936.**—*Rep. Dep. Agric. Trin. Tob.*, *1936*, pp. 52–56, 1937.

In this report [cf. *R.A.M.*, xv, p. 705] it is stated that during 1936 cacao witches' broom (*Marasmius perniciosus*) became more prevalent

than formerly in all affected areas in Trinidad though substantial acreages are still free from the disease. For example, the number of brooms counted on 24 estates in districts of heavy and medium infection in 1934, 1935, and 1936 was, respectively, 19,297, 38,021, and 62,192. On the Government cacao estate at Marper, where all diseased tissues are collected and destroyed every other month, 448,500 diseased tissues were collected in 1936, as against only 166,495 in 1935. The cost of control at Marper including supervision amounted to \$5·4 per acre in 1936, as against \$4 in 1935, but effective control under commercial conditions in areas of medium or severe infection would probably not cost more than \$3 to \$3·5 per acre. Observations on a block of 100 trees in a heavily infected area showed that the monthly production of sporophores for August to December, inclusive, amounted to 1,010, 4,805, 19,395, 6,373, and 9,084, the corresponding rainfall figures being 10·1, 12·77, 9·39, 17·37, and 15·04 inches. Very wet or very dry weather is unfavourable to sporophore production, which reaches a peak during showery weather, but in this case the high figure for October may be associated with a drop in temperature. Counts made on eleven selected properties during the whole cropping period showed that the average loss of mature pods due to the disease was 33 per cent. of the crop, the lowest and highest figures being 8 and 67 per cent., respectively. On the Marper estate the loss was about 6 per cent. Of 200,000 trees under observation for resistance only about 12 remain for further experimental testing.

Moko disease of bananas (*Bacterium solanacearum*) [ibid., xv, p. 75] was found to be practically absent from some areas and relatively widespread in others. *Cercospora musae* [ibid., xvi, p. 624] is known to affect the Giant Governor, Governor, Gros Michel, and Sucrier banana varieties; its incubation period may extend for over two months, and dissemination occurs through the agency of wind and rain. In one locality many Gros Michel stools showed a blue-black discoloration of the vasculars of the central tissues of the rhizomes, which experimental evidence indicated was a form of water-soak.

Mild scab (*Sphaceloma fawcettii*) [*Elsinoe fawcetti*] infection was noted on the foliage of over 1,000 four- to seven-year old Marsh grapefruit trees growing on 300 acres of old cacao land in the Santa Cruz Valley [ibid., xvi, p. 527]. The fungus was first noted by the writer on grapefruit in Trinidad in 1922 in the Diego Martin district on miscellaneous grapefruits, including Marsh, which is known to be moderately susceptible, and since then has been found on King and Curaçao oranges. The disease appears to have been present for only a few months in Santa Cruz Valley, and may have been favoured by heavy dews. All infected tissues should be collected and destroyed.

Papaw was seriously affected by mosaic [ibid., xv, p. 385], stem canker, and *Asperisporium* leaf disease [*A. caricae*: ibid., xv, p. 240].

MILBRATH (D. G.). **Bureau of Plant Pathology.**—ex *Rep. Calif. Dep. Agric., 1936* (*Bull. Dep. Agric. Calif.*, xxv, 4), pp. 575–582, 1937.

Peach mosaic [*R.A.M.*, xvi, p. 543] was recorded in the latter part of 1935 in the Riverside and San Bernardino counties of California, and has since been found in San Diego where only 19 trees were affected

and these were immediately destroyed. Under an eradication campaign [cf. ibid., xvi, p. 88] an intensive survey showed the disease to be present over 101 square miles, and so far 8,678 mosaic-infected trees have been removed together with 27,012 abandoned trees.

The results of maintaining celery-free periods in the vicinity of Venice with the object of controlling western celery mosaic [ibid., xv, p. 191] have been very gratifying. The yields have been increased and the quality improved.

A system of freeing wash water from sugar beet factories from sclerotia of *Sclerotium rolfsii* [ibid., xv, p. 518] was installed at a factory in Clarksburg, Yolo County, based upon principles of settling, flotation, and screening. With an intake of 800 galls. per minute no evidence of sclerotia passing out of the cleansing system was found in several tests.

Re-examination of two plantings of chestnut previously infected with blight [*Endothia parasitica*: ibid., xiv, p. 726] resulted in the discovery of 17 lightly infected trees and 1 severely infected, all apparently the result of initial infection several years previously. The diseased trees were uprooted and burnt.

Dead arm of grapes caused by *Cryptosporella viticola* [ibid., xvi, p. 299] was found in Sacramento and Los Angeles counties in 1935. Sanitation, spraying, and dusting have had some controlling effect on the disease.

Berthelot (A.) & Amoureux (Germaine). **Remarques sur l'utilisation des plantules aseptiques pour l'étude de la formation des tumeurs.** [Observations on the utilization of aseptic seedlings for the study of tumour formation.]—*C.R. Acad. Sci., Paris*, cciv, 18, pp. 1360–1362, 1937.

The authors describe their method of maintaining and inoculating seedlings with *Bacterium tumefaciens* [*R.A.M.*, xvi, p. 303] during autumn and winter, pointing out that it is necessary to avoid large lesions and wherever possible merely to apply the inoculum locally by means of solutions or suspensions, any tendency to evaporation being carefully watched. By keeping the sterile seedlings in culture tubes in a dark chamber at 25° to 27° C. for a few days before and after inoculation with *Bact. tumefaciens* the production of tumours is greatly expedited; in one such case a gall was found to measure 10 by 6 mm. after 14 days, 7 of which were spent in the dark.

Link (G. K. K.), Wilcox (Hazel W.), & Link (Adeline De S.). **Responses of Bean and Tomato to Phytomonas tumefaciens, P. tumefaciens extracts, β-indoleacetic acid, and wounding.**—*Bot. Gaz.*, cxviii, 4, pp. 816–867, 22 figs., 1937.

The differential responses of Red Kidney bean (*Phaseolus vulgaris*), Marglobe, Bonnie Best, and Ponderosa tomatoes, and *Bryophyllum* to inoculation with pure cultures of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvi, p. 660] are attributed to variations in the axial growth patterns of the host. Beans are strongly disposed following wounding to the formation of surface and internal callus and their derivatives, adventitious roots, root regeneration, and root fasciation. Growth substances are apparently formed or activated in all the aerial vegeta-

tive organs and transported to the main axis, where they move chiefly downwards, though upward and transverse motion also occurs. The introduction into beans and tomatoes of varying concentrations of heteroauxin paste under diverse conditions was found to induce practically the entire range of known phytopathological conditions, including tumour formation.

Bact. tumefaciens produces β-indoleacetic acid (heteroauxin) in dextrose-tryptophane or in dextrose-tryptophane peptone liquid or solid (agar medium). The crude ether extract of the organism induces in beans and tomatoes symptoms resembling those caused by inoculation with *Bact. tumefaciens* or heteroauxin treatment [ibid., xv, p. 782]. Practically identical histological and cytological effects follow the introduction of unequal amounts of 3 per cent. heteroauxin paste and crude extract of *Bact. tumefaciens* into the bean hypocotyl, viz., cell enlargement and division, with the resultant suppression of normal differentiation and maturation, which are replaced by the development of new meristems and fresh differentiations in abnormal sites. Schizogenous cavities are formed and ultimately filled with peripheral callus.

The paper concludes with a theoretical discussion of the etiological implications of these experimental data, in connexion with which a tentative nomenclature and classification of growth substances are proposed, and hypotheses are advanced in partial explanation of legume nodules, mycorrhiza, and other agricultural phenomena in terms of auxones.

WEHNELT (B.). **Mathieu Tillet—Tilletia. Die Geschichte einer Entdeckung.** [Mathieu Tillet—*Tilletia*. The history of a discovery.]—*Nachr. SchädlBekämpf., Leverkusen*, xii, 2, pp. 45–148, 15 figs. 1 diag., 1937. [English, French, and Spanish summaries on pp. 147–148.]

This is an interesting, fully documented historical study on the outstanding contributions of the French economist, Matthieu Tillet (1714 to 1791), to the knowledge of cereal diseases, especially wheat smuts, which are commemorated in the genus *Tilletia*.

GORLATCH (A. A.). Наследственность устойчивости к бурой ржавчине у гибридов мягких Пшениц. [Inheritance of resistance to brown rust in soft Wheat hybrids.]—*Науч. Зап. по Сахарн. Промышл.* [*Sci. Notes Sugar Indus. Agron. Part.*], Kieff, [Grey Ser.], xiii, 5–6, pp. 138–151, 1937.

A summarized account is given of genetical studies from 1930 onwards at the Belaya-Tzerkoff Experimental Breeding Station [Ukraine] on the inheritance of resistance to brown rust (*Puccinia triticina*) [*R.A.M.*, xvi, p. 522] in hybrids between two local soft wheat (*Triticum vulgare*) lines (037 and 074), each possessing one factor (R) for resistance and one factor (S) for partial resistance to the rust, and other wheat varieties of varying genetical constitution for resistance. In crosses between the local line 037 and Minhardi or Belaya-Tzerkoff 6182 lines, neither of which possesses either factor, susceptibility in F_1 was dominant, and in F_2 segregation occurred on the basis of two factor pairs, while in crosses between the same line and Ukrainka or Poltavka.

each only possessing the S factor, resistance was dominant in F_1, and segregation in F_2 occurred on the single factor basis. Crosses between 037 and Co-operatorka gave an intermediate type of inheritance in F_1. From a practical standpoint, it is stated that the work has led to the development of a number of lines very nearly equal in resistance to brown rust to the resistant parents 037 and 074, while combining most of the desirable commercial properties of the susceptible parent Ukrainka, and which during the heavy rust year 1935 gave an increase of 50 per cent. in their yield over the standard Ukrainka variety.

HUMPHREY (H. B.), JOHNSTON (C. O.), & CALDWELL (R. M.). **A revision of the numbers assigned to physiologic races of the leaf rust of Wheat, Puccinia triticina Eriks.**—*U.S. Dep. Agric., Bur. Pl. Ind., Div. Cereal Crops & Dis.*, 14 pp., 1936. [Mimeographed. Received September, 1937.]

Recent confusion in numbering physiologic races of leaf rust of wheat (*Puccinia triticina*) has led the authors to propose a revised and partly renumbered list of races, with an accompanying key and table of reactions. Scheibe's race 16 [*R.A.M.*, ix, p. 767] is retained, but the four races separated by Waterhouse [ibid., xi, p. 629] are designated 26 A, 26 B, 68 A, and 68 B, and it is recommended that when races are subdivided through the use of other differential varieties the subdivisions be distinguished by letters. Mehta's race 55e [ibid., xiii, p. 500] is renumbered 63, as 55 has already been used by Sibilia [ibid., xvi, p. 89]. The race 56 of Stakman *et al.* [ibid., xv, p. 242] is now race 64 for a similar reason. Races 57 and 58 of these workers are only sub-races of 68, described by Florence M. Roberts as a mutant of an English race [ibid., xv, p. 707]. The writers combine Sibilia's races LXVII P, LXVIII P, and LXXII P as race 84, and regard his LXXI P, LXXIII P, and LXXIV P as coming within races 58, 4, and 25, respectively. Sibilia's LXIX P and LXX P are unquestionably new races and are numbered 85 and 86, respectively.

LAROSE (E.) & VANDERWALLE (R.). **Quelques résultats d'infection artificielle d'Ustilago nuda tritici Schaff. sur le Froment.** [Some results obtained in the artificial infection of Wheat by *Ustilago nuda tritici* Schaff.]—*Bull. Inst. agron. Gembloux*, vi, 2, pp. 81–87, 1937. [Flemish, German, and English summaries.]

In studies on the nature of the resistance shown by some wheat varieties in Belgium to loose smut (*Ustilago tritici*) [*R.A.M.*, xvi, p. 166] the authors artificially infected three susceptible varieties (Hybride 40, Hybride Vilmorin 27, and Prince Léopold) and three completely resistant ones (Hybride du Jubilé, Hybride Vilmorin 23, and Hybride du Joncquois) by brushing the spores of the fungus on to the stigmas while the glumes were open. The seed thus produced from the susceptible varieties yielded susceptible plants and that from the resistant varieties gave plants that remained unaffected, indicating that resistance results from internal biological factors, and not from the morphological character of the ear.

The following reciprocal crosses were then made between susceptible and resistant wheats, viz., Pansar III (resistant)×Hybride 40, Hybride

40×Pansar III, Pansar III×Hybride 27, Hybride 27×Pansar III, Pansar III×Prince Léopold, and Prince Léopold×Pansar III, and artificial floral infections made at pollination. No smutted ears occurred in the F_1 generation, showing that resistance was entirely dominant in whatever direction the crossing was made.

When ears from F_1 plants of various crosses between resistant and susceptible wheats were artificially infected with loose smut during flowering, the F_2 plants subsequently showed a very marked dominance of resistant forms. Under conditions of natural infection the progeny of crosses between susceptible and resistant wheats showed far fewer susceptible than resistant lines.

LUTHRA (J. C.), SATTAR (A.), & GHANI (M. A.). **A comparative study of species of Septoria occurring on Wheat.**—*Indian J. agric. Sci.*, vii, 2, pp. 271–289, 3 pl. (1 col.), 3 graphs, 1937.

Comparative studies are described on a species of *Septoria* causing a serious disease of wheat in the Punjab, the strain studied having been isolated from spots on wheat leaves at Lyallpur in 1933, a culture of *S. tritici* [*R.A.M.*, xvi, p. 299] received from the Centraalbureau voor Schimmelcultures, Baarn, and an isolation of *S. nodorum* [ibid., xiv, pp. 348, 678] obtained from Kenya in 1933. Pycnidia of the first-named fungus were noted on wheat stems and awns for the first time in 1935, but no definite spots were formed on these parts. *S. tritici* from Baarn produced similar symptoms to the foregoing and it was also found capable of infecting the stem and awns. *S. nodorum* caused chocolate brown spots on the upper half of the glumes. All three organisms were found to be highly specialized on wheat. The Lyallpur species of *Septoria* resembled the Baarn strain of *S. tritici* in all essential respects, only differing very slightly in some minor characters, e.g. the Lyallpur strain grows more slowly in culture, produces less aerial mycelium, generally forms darker colonies on the media tested, has 1- to 4-septate pycnospores instead of 2- to 5-septate (or 2- to 7-septate in culture), and produces conidia in abundance. These differences are of little systematic importance and the Lyallpur strain is identified as a slow-growing strain of *S. tritici*, thus confirming the record by Sydow and Butler of *S. tritici* on wheat collected at Lyallpur in 1905 (*Ann. Myc.*, xiv, p. 214, 1916). *S. nodorum* is regarded as a valid, distinct species.

FOËX (E.) & ROSELLA (E.). **Un Sclerotium parasite du Blé.** [A *Sclerotium* parasitic on Wheat.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 221–31, 10 figs., 1937.

A brief account is given of a disease of wheat, which occurred from 1929 to 1931, inclusive, in the Ile-de-France (France), and specimens of which were also received from Morocco. The chief symptom is the development on the host stem or sheath, usually on the first internode from the base, of an oval, colourless spot with a brown margin, and bearing on the surface a hyaline, cylindrical, septate mycelium which in time thickens into slightly darker agglomerations; from the under surface of these, hyphae penetrate the cuticle and the epidermal cell-walls, being markedly constricted at the point of entry. After the death of the host the fungus forms globose or oval, glabrous, at first reddish-brown

and later blackish-brown sclerotia, measuring from 250 to 1,500 or even 2,000 μ, within its tissues. It was readily isolated from the lesions on ordinary media, and produced sclerotia in some 12 days at 20° to 25° C.; it was experimentally shown to be pathogenic to wheat seedlings, rapidly killing those eight days old or less, and producing localized infection on the sheaths or leaves of older ones. In the field attacked plants may either show no difference from healthy ones, or show scalding symptoms together with stunting, and may occasionally lodge. The fungus, no fructifications of which were found in nature or obtained in culture, is considered to be new to science and is named *Sclerotium costantini*, with a Latin diagnosis.

Blair (I. D.). **An investigation of foot rot of Wheat in New Zealand.**—*N.Z.J. Sci. Tech.*, xix, 1, pp. 1–21, 3 figs., 1937.

During the past few years wheat crops in New Zealand have been affected by a widely distributed foot rot causing a wilting and death of the seedlings or a yellowing of the leaves and a check to growth, besides stem and root decay.

In this preliminary study isolations from six soils yielded cultures of *Fusarium*, *Alternaria*, *Penicillium*, and *Rhizopus*, and the two former species being predominant the author confined his attention to these two groups. Comparison of a named culture of *F. culmorum* obtained from Geach [*R.A.M.*, xi, p. 708] with the strains of *Fusarium* isolated revealed a great similarity between the cultures, the differences observed being probably due to the existence of physiologic strains. Pathogenicity tests showed that most of the isolations were as virulent as the authentic strain of *F. culmorum*, two strains only being less vigorous; the isolants caused the death of the shoots soon after germination, stunting of the seedlings, poor root development, and brown lesions on the underground stems, and were successfully re-cultured from the infected plants. Inoculations with three cultures of *Alternaria* gave positive results, but both the *Fusarium* and *Alternaria* isolations are regarded as weak parasites.

Observations in the field showed seedling blight, 'spring yellows', and whiteheads to be present, the last-named symptoms being probably due either to *Fusarium* infection at the crown or to mechanical fracture.

Symptoms of wheat scab were also observed during the 1934–5 harvest, and isolations from diseased glumes and grain yielded cultures of *Fusarium* and *Alternaria* to which the condition is attributed. *Alternaria*, *Cladosporium*, and occasionally *Fusarium* were isolated from grains showing a black discoloration of the germ end and *Cladosporium* from 'black heads' in which the glumes were covered with greenish black specks.

In a survey of 92 wheat crops in Canterbury in 1935 only 11 showed no sign of the disease. Seedling blight was severe in soils of high natural fertility and the more acid the soil the higher was the degree of seedling infection. *Agropyron repens*, perennial rye grass [*Lolium perenne*], and barley grass (*Hordeum*) [*murinum*] were found infected by the pathogen. Foot rot may appear after any crop and continuous growing of wheat did not result in increased infection. In discussing control measures

data are given showing that winter-sown crops are more severely attacked than others, and the deeper sown seed than the shallow sown; there was evidence that the yield of crops showing spring yellows can be improved by top dressing with fertilizers. In seed disinfection experiments treatment with copper carbonate, ceresan, and agrosan improved germination from 77·8 per cent. in the inoculated control to 83·8, 81·8, and 80·6 per cent., respectively.

Hynes (H. J.). **Species of Helminthosporium and Curvularia associated with root rot of Wheat and other Graminaceous plants.**—*J. roy Soc. N.S.W.*, lxx, pp. 378–391, 1 pl., 3 figs., 1937.

The author discusses all the species of *Helminthosporium* that have been found in association with root rot of wheat, viz., the large spored species *H. bicolor* [*R.A.M.*, x, p. 758], *H. halodes* var. *tritici* [loc. cit.], *H. pedicellatum* [ibid., iv, p. 408; xii, p. 782], *H.N.* of Henry [ibid., xiv, p. 611], and *H. sativum* [ibid., xiv, p. 622] and the small-spored *H. tetramera* (*Curvularia spicifera*) [loc. cit.] and *H.M.* (*C. ramosa*) [loc. cit.]. The three last-named occur in Australia. *H. sativum* has been isolated from wheat, oats, barley, rye and several grasses and has been obtained from all States excepting Tasmania; there is no doubt it is the predominant large-spored species associated with wheat root rot throughout Australia. *C. spicifera*, with conidia measuring 23·5 to 25 by 8·5 to 9 μ, occurs on wheat, oats, barley, and rye in New South Wales but is not important pathogenically; *C. ramosa*, with conidia averaging 32·6 by 13·0 μ and 35·3 by 13·3 μ for two strains, respectively, occurs on wheat, oats, barley and various grasses, and has been recorded from New South Wales, Victoria, and South Australia; certain strains of this species are stated to be extremely virulent to cereal seedlings.

Pittman (H. A.). **Take-all and similar diseases of Wheat and how to control them.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xiv, 2, pp. 103–112, 4 figs., 1937.

A popular account is given of take-all (*Ophiobolus graminis*) [*R.A.M.*, xvi, p. 523] and foot rot (*Helminthosporium sativum*) [ibid., xvi, pp. 231, 524] of wheat, which during recent years have become the most serious diseases of the crop in Western Australia, the three-year rotation system (fallow, wheat, pasture) practised in many parts of the wheat belt tending to increase infection in succeeding wheat crops, and many farmers failing to resort to systematic control methods. *O. graminis* is most prevalent in warm, moist periods during spring on old land sown to wheat continuously, and is especially common in wet, badly drained localities, or where a field has been allowed to grow into grass. It is uncommon and need never be feared on well-managed farms. *H. sativum* is not yet widely present locally. *Wojnowicia graminis* [ibid., xiv, p. 569; xv, p. 566] has been found on wheat and barley grass (*Hordeum murinum*) but its parasitism is questionable.

Recommended control methods (designed to starve out the fungi and improve the growth of the host) comprise in addition to those already noted [ibid., xi, p. 567] sowing after the beginning of the autumn rains, late planting of an early maturing variety on land where heavy losses have occurred, avoidance of the practice of feeding-off the crop

on affected land, of allowing affected paddocks to go to pasture, and of placing bags of wheat or chaff in bare patches caused by the disease, and cutting infected crops for hay at not less than 4 or 5 in. from the ground.

Samuel (G.). **Whiteheads or take-all in Wheat.**—*J. Minist. Agric.*, xliv, 3, pp. 231–241, 3 pl., 1937.

Many severe outbreaks of take-all of wheat (*Ophiobolus graminis*) [see preceding abstract], which has become increasingly prevalent on the lighter soils of Norfolk, Hampshire, and the Yorkshire Wolds, result from ploughing up a slightly diseased stubble, the new roots reaching the infected material before it has rotted away. The ploughing-in of apparently healthy grass, in the roots of which the fungus may live for years, may have a similar result. The data so far obtained from a systematic study at Rothamsted indicate that in the moisture conditions prevailing in English soils the fungus cannot persist for a year if the stubble has been ploughed under. Wheat may safely be sown early on land left fallow for several months or planted to a non-cereal, but after a previous wheat crop stubble should be ploughed in early, and the seed sown late.

Dissemination by wind-borne spores may occur when infected stubble is left untouched, but as spore ejection occurs only during or immediately after rain it is improbable that large numbers of spores are carried more than a few hundred yards, and the majority are unlikely to reach growing roots that they can infect. If, however, the prevailing winds did carry spores over young cereal crops on light soils many would be washed down into contact with the roots.

When wheat becomes affected the source of infection should if possible be determined in order to prevent a recurrence. If other factors do not intervene, infection from mycelium in the soil generally produces definite patches of disease, sometimes evenly distributed over the field, while spore infections produce individual diseased plants scattered throughout the crop and becoming progressively fewer with increasing distance from the source of infection.

The disease is more severe on light or alkaline soils or those poor in organic material than on heavy or acid soils or those rich in organic material. Dung dressings may reduce infection. Unless the soil is distinctly acid preference should be given to sulphate of ammonia rather than the more alkaline nitrate of soda or nitro-chalk as a nitrogenous dressing. Red wheats are more resistant than white, but may be badly attacked. Barley is moderately susceptible, and although oats are almost immune in Australia, they occasionally become infected in England owing to the wetter climate. Rye grasses (*Lolium* spp.) are very resistant. Measures recommended for control include early ploughing-in of stubble, crop rotation, appropriate manuring, and cultivation of light soil fallows to destroy grasses and to make a firm seed-bed.

Adam (D. B.) & Colquhoun (T. T.). **Barley diseases in South Australia and their control.**—*J. Dep. Agric. S. Aust.*, xl, 10, pp. 787–792, 1 fig., 1937.

After briefly referring to the diseases of barley occurring in South

Australia the authors record the discovery of leaf stripe (*Helminthosporium gramineum*) on the crop for the first time in the State, where the disease has probably been present for some years. In experiments on the control of covered smut of barley (*Ustilago hordei*) in 1935, treatment by formalin sprinkle (1 in 320) or formalin steep (1 in 400 for 30 minutes) reduced the percentage of smutted plants from 5·8 in the control to 2·1 and 0·2, respectively, while dusting with copper carbonate (2 oz. per bush.) reduced it to 1·2 and treatment with ceresan U.T. 1875 A and agrosan G eliminated the disease entirely. In tests in 1936, complete control was again given by ceresan U.T. 1875 A and agrosan 13536. Experiments on the control of barley stripe in 1936 showed that ceresan U.T. 1875 A and agrosan 13536 were effective while formalin sprinkle (1 in 320) and copper carbonate partially controlled the disease.

Allison (C. C.). **Studies on the genetics of smuts of Barley and Oats in relation to pathogenicity.**—*Tech. Bull. Minn. agric. Exp. Sta.* 119, 34 pp., 8 figs., 1 diag., 1937.

In this account of a study made in Minnesota of the genetics of barley and oats smuts (*Ustilago* spp.) in relation to pathogenicity the author states that the partial vacuum method of barley seed inoculation [*R.A.M.*, xvi, p. 595] with chlamydospores of *U. hordei* and *U. medians* gave much better results than dusting and was also more satisfactory for inoculating barley or oat seeds with monosporidial combinations.

The results obtained [which are tabulated and discussed] showed that collections of *U. hordei* differed from one another in their virulence on 11 barley varieties, 27 out of 28 collections being differentiated on 6 out of the 11 varieties, while 3 collections were further differentiated on Minnesota No. 474 barley, grown in the greenhouse, on a basis of the type of smutted plant produced. Factors for sex of *U. hordei* and *U. medians* segregated in the ratio of 2:2, while those for cultural characters in *U. hordei* segregated in the ratios of 3:1, 2:2, and 0:4, independently of the factors for sex. Variants differing culturally from the parent colonies were observed.

From investigations on the hybridization of *U. hordei* and *U. medians*, some results of which have been noticed from another source [ibid., xiv, p. 352], it was found that the two species hybridized readily with each other as shown by sporidial fusion and the production of viable chlamydospores. Combinations of head type and chlamydospore wall markings different from either parent type were observed in the F_2, and segregation for pathogenicity occurred in the F_2 dicaryophytes, some of which were more pathogenic than the parent dicaryophytes on some barley varieties.

U. hordei and *U. medians* hybridized with *U. avenae*, *U. levis*, and *U. tritici* to the extent of fusions and initiation of the dicaryophase, but seed inoculations with these combinations failed to produce smutted heads, and no smut hyphae were noted in the seedlings. The nuclear condition of the sporidial fusions differed very little in intra- and interspecific crosses. The dicaryophase was initiated shortly after fusion when the two nuclei became associated in the same sporidium. When the chlamydospores of *U. hordei* germinated beneath the hull of the

seed they typically produced a promycelium, the cells of which fused readily, the resultant nuclear condition resembling that of fused sporidia. The mycelium of *U. hordei* was predominantly dicaryotic in the host, but cells with one nucleus or more than two nuclei were observed in many hyphae.

RAINIO (A. J.). **Kauralaatujen punahome-Fusarium-roseum Link—Gibberella saubinetii (Mont.) Sacc. kestävyydestä.** [The resistance of certain varieties of Oats to *Fusarium roseum* Link—*Gibberella saubinetii* (Mont.) Sacc.]—*Valt. Maatalousk. Julk.*, 92, 24 pp., 2 figs., 3 graphs, 1937. [German summary.]

The writer tabulates and discusses the results of his studies in 1933–4 on the reaction to *Gibberella saubinetii* [*R.A.M.*, xvi, p. 665] of 137 varieties of oats, the seed-grain of which was inoculated before sowing with conidial suspensions of the fungus [ibid., xiii, p. 157]. All the naked oats used in the tests were found to be very susceptible, the average incidence of infection for the group being 17·8 per cent. as compared with 6·9 per cent., for those provided with glumes. The average percentages of infection for the varieties with yellow, white, grey, and black glumes were 6·1, 6·9, 6·8, and 3·2, respectively. Varieties with open sutures, which facilitate the admission of the hyphae to the caryopses through the fissures between the outer and inner glumes, such as Simo and Esa, are in general more severely attacked by *G. saubinetii* than those with semi-closed (Osmo II and Kytö) or closed ones, e.g., Early Mountain, the incidence of infection in which was only 0·3 per cent. The average percentages of infection among the early varieties with open and semi-closed sutures were 4·2 and 3·4, respectively, the corresponding figures for the medium-early group being 7·2 and 4·2, for the medium-late 8·4 and 5·3, and for the late 10·3 and 6·0, respectively. Early varieties tend to be more resistant to *G. saubinetii* than late ones, the infection percentages for the early, medium-early, medium-late, and late groups being 3·6, 4·7, 6·9, and 8·4, respectively. Resistance to the fungus would thus appear to depend primarily on the interaction between earliness and the character of the suture.

KORNFELD (A.). **Bekämpfung des Maisbeulenbrandes auf biologischer Grundlage.** [Control of Maize smut on a biological basis.]—*Z. PflKrankh.*, xlvii, 5, pp. 277–297, 1937.

A comprehensive, tabulated account is given of the writer's experiments, in progress in Rumania since 1925, in the control of maize smut (*Ustilago zeae*) [*R.A.M.*, xvi, p. 448] on lines dictated by a study of the biology of the pathogen.

The optimum temperature for the development of the smut was found to lie between 20° and 25° C. according to its locality of origin. The reaction of the fungus to acids is of importance from the silage standpoint; the strongest inhibitory action on spore germination was exerted by butyric and the weakest by lactic acid (16·20 and 52·23 per cent. germination, respectively, in the presence of 2 per cent. concentrations), citric and acetic acids being intermediate in this particular (35·27 and 30·14 per cent. germination, respectively). The preference of the

local (Mediasch, Transylvania) peasantry for the lactic acid type of silo fermentation is therefore not altogether desirable.

Infection was experimentally shown to take place primarily through wounds, though the entry of the spores may also be effected by way of the stomata. When inoculations were made through the root-collar, 10·4 per cent. of the smut boils were formed at the site of infection, 43·5 per cent. on the stem, 5·8 per cent. on the leaves, 6·4 per cent. on the cob, and 6·4 per cent. on the male panicles, the corresponding figures for inoculation at the third stem node being 12·0, 26·4, 14·3, 32·1, and 3·5 per cent., respectively.

Observations from 1928 to 1930 showed that severe infection may be expected to follow a mean June temperature exceeding 20°, while hailstorms are liable to increase the percentage of smut. Laboratory experiments showed that the fungus is incapable of withstanding the high temperatures occurring in fermenting farmyard manure. The results of field experiments indicated that well rotted manure is preferable to fresh, but nitrogen in any form should only be used sparingly.

The results of varietal reaction tests showed Canadian and Ninety Day to be virtually immune under local conditions at Mediasch; Fodder Sugar, Szekler, and Yellow Baden resistant; Queen of the Prairie, Gold Maize, Bankut, and Janetzki's Early moderately susceptible; and King Ferdinand and Timar's Pearl highly so.

A distance of at least 80 cm. should separate the maize rows, and strict precautions must be taken to avoid injuring the plants in the course of hoeing and other cultural operations. Maize should not be sown before the soil temperature reaches 10° (about 5th May in Transylvania in 1930); the infection percentages for the stands sown on 15th and 25th April, 5th, 15th, and 25th May, and 5th June being 31·50, 24·17, 20·65, 23·00, 16·83, and 14·29, respectively. The incidence of smut in plants raised from seed-grain taken from the middle of the cob was 8·58 per cent., compared with 12·19 for that from the base and tip, and 14·03 for damp and mouldy seed-grain. Experiments from 1925 to 1930, inclusive, showed the advantage of seed treatment with uspulun, the soil of the test plots being repeatedly dusted with ceresan to avoid external contamination. The spores of *U. zeae* were found to retain their viability (10 to 25 per cent.) for eight years in pure sand at a depth of 20 cm.; at 10 cm. 50 per cent. were viable after five years, and 100 per cent. after three years. In loam, clay, and humus there was a progressive diminution of viability, the last-named virtually inhibiting germination after the sixth year. It was shown by a test in which maize was grown in succession to maize for five consecutive years that the incidence of smut rose from 5·88 in the first to 43·08 per cent. in the fifth year, the corresponding figures for a control plot under rotation being 6·07 and 19·50 per cent., respectively. The boils should be cut out and burnt at an early stage in their development, preferably before spore formation commences in the interior.

McNew (G. L.). **Crown infection of Corn by Diplodia zeae.**—*Res. Bull. Ia agric. Exp. Sta.* 216, pp. 191–222, 7 figs., 1937.

A detailed study of crown infection of maize by *Diplodia zeae* [*R.A.M.*, xvi, p. 245] showed that the symptoms include a dark straw-

brown discoloration of the tissues of the crown and lower internodes, the presence of subepidermal pycnidia on the crown and round the aerial adventitious roots, the disintegration and shredding of the internal tissue of the crown, an intense brown discoloration of the nodal plates, and a dark brown decay of the mesocotyl, causing loss of the primary roots. From 1930 to 1933 this condition affected 14 to 52 per cent. of the field-grown maize in central Iowa.

Plants grown in infested soil from clean seed show the same symptoms as those from infected seed. The fungus grows through the soil, establishing itself in the wounds made in the mesocotyl by the emerging seminal roots. The crown may be directly invaded in this way, but as a rule is infected from the mesocotyl, the mycelium spreading slowly in the host during the growing season, but rapidly affecting the whole crown and lower nodes at maturity. The fungus, however, is not systemic, and is usually confined to the first internode above the roots.

Crown infection was induced by infecting steamed soil with parts of diseased plants that had overwintered in the field. The fungus was able to live in soil not containing plant refuse, but growth was hindered in mixed culture.

Invasion of the crowns from infected soil was most severe at high soil moistures, but the development of the diseased plants was greatly reduced at high and low soil moistures, while crown infection failed to reduce the dry weight of maize grown at the optimum soil moisture. The dry weight of roots in infected soil showed greater reduction than the tops, and light infections in low soil moisture were sometimes almost as injurious as heavy infections in abundant soil moisture. The transpiration ratio of diseased plants was increased at soil moistures favourable to the reduction of dry weight.

Plants grown from infected seed treated with a mercury dust containing 4·2 per cent. mercury white precipitate (mostly NH_2HgCl) had more crown infection than plants from untreated diseased seed, but the treatment of clean seed with the same dust reduced crown infection from 12·4 per cent. in the untreated to 9·8 per cent. in 1930 and from 58·4 to 47·7 per cent. in 1931, the dusting apparently only inhibiting, not killing, the fungus. The amount of crown infection under given conditions depends on the time of the initial infection; by delaying mesocotyl invasion from infected soil the treatment of clean seed may decrease crown infection.

Late crown infection is a significant phase of the infection of maize by *D. zeae*, the dry weight of the affected plants being halved under certain soil conditions and the yield reduced even when the soil factors are highly favourable. Some selfed lines of maize showed striking resistance to the disease.

Elliott (Charlotte), Melchers (L. E.), Lefebvre (C. L.), & Wagner (F. A.). **Pythium rot of Milo.**—*J. agric. Res.*, liv, 11, pp. 797–834, 21 fig., 1 graph, 1937.

This is a detailed report of the authors' investigations on the root rot of milo sorghums caused by *Pythium arrhenomanes*, partial accounts of which have already been noticed from other sources [*R.A.M.*, xv, p. 435; xvi, p. 33]. In addition to the information already imparted,

it is stated that the fungus has been shown by inoculation experiments to be actively parasitic on milo roots and also to attack sugar-cane and yellow dent maize. The disease is readily transmitted by mixing small quantities of infected soil or infected host material, with non-infected soil, or by soil water leachings from infested fields. It was further shown that *P. arrhenomanes* remains active in the soil for at least four years and was not controlled by ordinary rotations or fallow. Soil sterilization by steam, formaldehyde, and acetic acid is effective against the disease, but is not considered practicable.

Yu (T. F.). **Further studies on the kernel smut resistance in Millet.**—*Chin. J. exp. Biol.*, i, 3, pp. 235–240, 1937.

In attempts to discover promising lines of millet [*Setaria italica*] resistant to kernel smut [*Ustilago crameri*: *R.A.M.*, xvi, p. 159] inoculation and yield tests were carried out at Nanking and in all the chief millet-growing regions in China from 1932 to 1936 inclusive, with millets obtained from the materials reported in 1930 [ibid., x, p. 238], selections from them, pure-line millets provided by the co-operative stations, and head selections made by the author in Hopeh, Shantung, and Honan Provinces in 1932.

The results obtained [which are tabulated] showed that Nanking Nos. 18, 60, 61, and 65 to 77, inclusive, remained unaffected throughout the tests, while Pathology Nos. 2 and 8, and Nanking Nos. 63, 78, and 80 had under 1 per cent. infection. The slight variation in susceptibility indicates a varietal difference in smut reaction. Pathology Check was badly infected in all localities, while Nanking No. 79 was moderately resistant. Nanking No. 35 remained unaffected by the Nanking strain of the smut, but was slightly though uniformly infected by the Tsinan and Kaifeng strains. Nanking No. 47 remained unaffected by the Tsinan strain, but was susceptible to strains from Peiping. These results indicate a difference in the pathogenicity of the smut strains but the existence of biologic races cannot be regarded as definitely established on the data available at present.

In yield tests of these millets many showed promising results, especially the resistant types Pathology Nos. 2 and 8 and Nanking Nos. 63, 78, and 80. Yield was markedly affected, however, by environmental conditions and in attempts to develop smut-resistant millets it is better to make thorough tests of local lines than to use selections from other localities, where the conditions may be different.

Jensen (J. H.). **Chlorosis of Citrus in Puerto Rico.**—*Phytopathology*, xxvii, 6, p. 731, 1937.

Porto Rico grapefruit trees are liable to a condition closely resembling the disorder known in California as 'mottle leaf' [*R.A.M.*, xvi, p. 669] and in Florida as 'frenching' [ibid., vii, p. 441]. In Porto Rico this chlorotic condition has been found exclusively on alkaline soils (P_H 8 to 8·5). Promising results in its control have been obtained by the application to five-year-old trees of aqueous solutions of zinc sulphate [ibid., xvi, p. 605], which induced refoliation and a return of the normal green colour.

Stahl (A. L.) & Camp (A. F.). **Cold storage studies of Florida Citrus fruits. I. Effect of temperature and maturity on the changes in composition and keeping quality of Oranges and Grapefruit in cold storage.**—*Bull. Fla agric. Exp. Sta.* 303, 67 pp., 9 figs., 2 diags., 2 graphs, 1936. [Received September, 1937.]

In storage experiments on Valencia and Pineapple oranges in Florida, an insignificant amount of storage pitting [*R.A.M.*, xvi, p. 528] occurred at all temperatures but the trouble was slightly more noticeable at the colder temperatures and on the Pineapple variety. Decay (chiefly *Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) increased with the raising of the storage temperature and with prolongation of the storage period. Fruit kept best at 32° and 37·5° F. but that stored at the latter temperature remained marketable longest on removal to room temperature.

Silver Cluster and Marsh Seedless grapefruit showed severe pitting at 32° and 37·5° after several weeks storage but in fruit held at 54° and 58° pitting was never severe until after the lapse of three or four months. The amount, severity, and rapidity of decay varied directly with the temperature; it was almost negligible at 32° and 37·5° but very severe at higher temperatures in both varieties. Fruit stored at 37·5° and 42° remained marketable longest after removal from storage, and the former temperature is recommended for unwrapped, untreated fruit.

Stahl (A. L.) & Fifield (W. M.). **Cold storage studies of Florida Citrus fruits. II. Effect of various wrappers and temperatures on the preservation of Citrus fruits in storage.**—*Bull. Fla agric. Exp. Sta.* 304, 78 pp., 23 figs., 1936. [Received September, 1937.]

The effects of 22 different wrappers on Pineapple and Valencia oranges and Silver Cluster grapefruit at storage temperatures varying from 32° to 58° F. are described. The S.S.T. and S.A.T. grades of cellophane, and No. 88 regular kodapak wrappers (all semi-moisture proof) gave the best results in controlling pitting [see preceding abstract] in oranges but were closely followed in order of effectiveness by oiled and waxed papers and then by the moisture-proof wrappers. Fruit in a number of other wrappers showed less pitting than unwrapped fruit. Temperature and not wrappers was the factor controlling pitting, the amount of pitting decreasing with an increase in temperature. Pineapple oranges showed considerable pitting after one month's storage, especially at the lower temperature whereas Valencias showed practically none after five months. The best storage temperature for both varieties was 37·5°.

The amount of decay (chiefly *Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) in oranges varied directly with the storage temperature, length of storage, and moisture retentiveness of the wrapper; decay was negligible at temperatures below 42°, but at this temperature and above it was high in both varieties. No outstanding difference in the control of decay was manifest among the wrappers used.

Pitting was much more severe in grapefruit than in oranges but temperature and not wrappers was again the controlling factor, pitting being severe at the colder temperatures. The moisture-proof cellophane and aluminium foils, with the wet waxed paper proved most effective

in reducing or retarding pitting. Wrapped fruit averaged less pitting than unwrapped, but tissue wraps had little effect.

The efficacy of wrappers in preventing grapefruit decay varied with the different temperatures, no one wrapper being consistently good or bad at all temperatures. Decay was directly correlated with temperature, the higher temperatures causing higher percentages of decay. The best storage temperature for all varieties was 37·5°; above this temperature decay was much more prevalent while below it pitting was more severe. The box liner was as efficient as the individual wrapper in all respects except the prevention of 'nesting' (the condition in which an organism spreads from one fruit to all fruits in contact with it). Taking general appearance, loss in weight, and all other factors into consideration, the most efficient wrapper was plain aluminium foil, followed by M.T. cellophane, moisture-proof sylphrap, and kodapak. Fruit wrapped in moisture-proof wrappers and held at 37·5° kept best after removal from storage.

AJON (G.). **Studii sul malsecco degli Agrumi.** [Studies on mal secco disease of Citrus.]—*Ann. Staz. Agrum. Frutt. Acireale*, xiv, pp. 1–136, 7 graphs, 1937.

In this collection of papers, published originally at various times between 1930 and 1936, the author gives a detailed account of his investigations into various chemical aspects of mal secco disease of lemons (*Deuterophoma tracheiphila*) [*R.A.M.*, xvi, p. 527] and in particular of the disturbance in mineral nutrition shown by affected trees (calcium and magnesium deficiency with excess of iron and acids). He considers that resistance depends mainly on the ability of the tree to elaborate certain chemotropically negative substances which neutralize the effects of the metabolism of the fungus, which in turn depends on balanced mineral nutrition. A thorough search should be made both locally and in India [ibid., xv, p. 361] for resistant types of lemon suitable to Sicilian conditions. Remedial measures based on improved cultural practices are indicated.

WARDLAW (C. W.). **Storage and transport of tropical fruits and vegetables.**—*Trop. Agriculture, Trin.*, xiv, 5, pp. 131–139, 1937. **Tropical fruits and vegetables. An account of their storage and transport.**—ibid., xiv, 6, pp. 163–170, 1937.

In these contributions the author gives a general account of the behaviour of citrus fruits in storage and transport, with full references to an extended bibliography of 114 titles appended to the second paper. Wastage in citrus is divided into two categories (i) blemishes and (ii) fungal rotting, and these aspects are discussed under the appropriate sections of the paper, the whole subject being treated under the headings of (1) pre-storage, including grove sanitation, picking, quailing, conservation of moisture, packing-shed treatments (including chemical treatments), skin blemishes, maturity tests and export regulations, and pre-storage delay, and (2) storage, comprising non-refrigerated transport, humidity in the storage room, storage temperatures, chilling, prolonged storage, delayed picking, and gas storage, and culture, production, and storage quality. Practically all the work mentioned of phytopathological importance has been noticed in this *Review*.

WINSTON (J. R.). **Harvesting and handling Citrus fruits in the Gulf States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1763, 37 pp., 20 figs., 1937.

In this account of the factors governing the merchantable condition of citrus fruits in the Gulf States and of the relation between harvesting and handling methods and the maintenance of the fruit in good condition, notes are given on the principal organisms causing decay and their control. Blue and green moulds (*Penicillium italicum* and *P. digitatum* [*R.A.M.*, xvi, p. 601], respectively) are the most widespread, occurring chiefly in the cooler months, temperatures of 50° to 70° F. being most favourable for their development. Fruit exposed to the high temperatures required in the ethylene colouring process (80° to 85°) is less liable to mould as the fungi responsible do not long survive at such temperatures. Stem-end rot (*Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) is a serious problem in Florida [ibid., xv, p. 797], under favourable conditions causing heavy losses ten days to a fortnight after harvest; losses may be reduced by treating the fruit with an 8 or 10 per cent. borax solution on arrival at the packing-house, careful colouring (de-greening), and prompt packing, followed by immediate refrigeration. *Colletotrichum* [*gloeosporioides*] is usually comparatively unimportant. Antiseptics were ineffective in controlling the condition, and refrigeration appears to be the best means of retarding its appearance. Brown rot (*Pythiacystis*) [*Phytophthora citrophthora* and *P. parasitica*: ibid., xiii, p. 25; xvi, pp. 312, 603] is very seldom serious locally, while blossom-end rot (*Alternaria citri*), though very prevalent, is also generally unimportant.

SANTINI (P.). **Contribution d'un médecin à l'étude du bayoudh, maladie du Palmier-Dattier.** [A doctor's contribution to the study of the 'baïoudh' disease of the Date Palm.]—*Arch. Inst. Pasteur Algér.*, xv, 2, pp. 271–276, 1 pl., 1937.

From date palms suffering from the 'baïoudh' disease in the oases of Foggaret ez Zoua and Hassi el Hadjar, Sahara, the writer isolated a fungus identified by Malençon as *Fusarium albedinis* [*R.A.M.*, xvi, p. 34]. According to native statements the disease in the former locality dates from the commencement of French occupation in 1900, assuming an epidemic character in 1910 and again in 1922, since when there have been successive serious outbreaks, reducing the number of trees in one garden from 6,000 to 200. At Hassi el Hadjar the first case was observed two years ago and at the time of inspection 37 palms were involved. Infection is believed to have been conveyed on an instrument for cutting the palms from Foggaret ez Zoua. In both localities the Tgaza variety is the most susceptible, Takerboucha being apparently immune. Cases of spontaneous recovery from 'baïoudh' have been observed, starting with the young fronds and progressing downwards.

ORIAN (G.). **Notes préliminaires sur une maladie du Palmier à Maurice, causée par le Bacterium vasculorum (Cobb) Gr. Smith.** [Preliminary notes on a Palm disease in Mauritius caused by *Bacterium vasculorum* (Cobb) Gr. Smith.]—*Rev. agric. Maurice*, 93, pp. 100–101, 1937.

The bacterium isolated from heart rot of white palms (*Dictyo-

sperma album) in Mauritius [*R.A.M.*, xvi, p. 516] and re-isolated from inoculated plants of the same host and maize was found to show the morphological and physiological characters of *Bacterium vasculorum*, this identification being confirmed at the Imperial Mycological Institute. Inoculations with the organism on sugar-cane leaves resulted in the development of characteristic symptoms. The disease causes rotting of the main rib of the leaves of *D. album* followed by a gradual drying-up of the plant. A yellowish gum is exuded by the vascular bundles of the trunk.

MONSMA (E. Y.). **A study of the water molds of the Lydell State Fish Hatchery at Comstock Park, Michigan.**—*Pap. Mich. Acad. Sci.*, xxii, pp. 165–182, 1937.

In an investigation of the water mould content of the Lydell State Fish Hatchery, Michigan, *Saprolegnia parasitica* [*R.A.M.*, xii, p. 93] was isolated 34 times from water and soil, and from September to January; *S. ferax*, 17 times; and 12 other species of *S.* from one to four times each. The streams supplying the Hatchery were highly contaminated and constituted the source of infection of the ponds and soil. The results of inoculation experiments showed that *S. parasitica*, *S. ferax*, and *S. diclina* and possibly some other species are capable of infecting the membranes of living fish eggs but were not parasitic on the fry of fish. *S. parasitica* and possibly other species were shown to infect older fish at injured points, causing death. The eggs were infected by means of zoospores as well as by hyphae and the best method known at present to keep the fungi under control is periodic draining and cleaning of the ponds.

KEVORKIAN (A. G.). **Studies in the Entomophthoraceae. I. Observations on the genus Conidiobolus.**—*J. Agric. P. R.*, xxi, 2, pp. 191–200, 3 pl., 1937.

A comparative study is described of *Conidiobolus villosus* isolated from living termites placed in damp chambers for observation in Cuba with strains obtained from the Farlow Herbarium and the Centraalbureau voor Schimmelcultures, [Baarn], Holland. Infection experiments showed that the fungus, hitherto considered a saprophyte, can become parasitic, especially on termites, though the Dutch strain appeared to be strictly saprophytic. An additional stage in the life-history of the fungus is constituted by minute conidia borne at the tips of spiny appendages of the villose conidia or 'resting spores' similar to those of *Delacroixia coronata*, with which *C. villosus* is regarded as synonymous. The genus *Delacroixia*, based on the microconidia, is not regarded as sound and the species is transferred to *Entomophthora* as *E. coronata*, the genus *Empusa* being illegitimate as it was used in 1824 for a genus of orchids.

DICKSON (E. C.). **Coccidioides infection: part I.**—*Arch. intern. Med.*, lix, 6, pp. 1029–1044, 4 figs., 1937.

This is the first of a series of reports based on a study of infection by *Coccidioides immitis* [*R.A.M.*, xvi, p. 611] in California, supplemented

by particulars of intensive experimental work conducted in the Department of Public Health and Preventive Medicine, Stanford University, during the past few years and by references to the relevant literature. Clinical observations are cited to show that the accepted description of coccidioidal granuloma is that of the advanced or terminal stages of an infection which is not commonly recognized in its acute phase. Evidence is adduced for the development of primary infection following the inhalation of chlamydospores of the fungus, leading to bronchopneumonia and erythema nodosum. The article concludes with a full account of cultural and inoculation studies of the fungus, the results of which correspond in general with those described by previous investigators.

CATANEI (A.). **Description de deux nouvelles espèces et d'une variété nouvelle de champignons provoquant des teignes chez l'homme.** [Description of two new species and a new variety of fungi causing ringworms of man.]—*Arch. Inst. Pasteur Algér.*, xv, 2, pp. 265–270, 2 pl. (1 col.), 1937.

During 1936 the writer isolated from human hair two new species of *Trichophyton* of the endothrix group and a new variety of *T. glabrum*. *T. pervesi* n.sp., responsible for three juvenile cases of ringworm in the Adrar region of the Sahara, formed on Sabouraud's glucose agar smooth, greyish-yellow colonies, which gradually assumed a purple tinge spreading outwards from the centre, the latter being surrounded by a white velvety ring. The periphery was composed of delicate rays in close proximity. On agar without sugar the colonies are smooth, irregularly plicate, with greyish-white, powdery or velvety, sulcate edges, while a downy, greyish-white or purple-tinged growth develops on barley or rice grains. On Sabouraud's agar numerous simple conidiophores of the *Acladium* type are produced with readily detachable conidia, the smooth portions of the colony yielding only chlamydospores. On natural substrata the conidiophores are furnished with one or more branches, and bear densely aggregated piriform conidia, 3 to 3·5 by 2 to 2·5 μ. Positive results were obtained in inoculation tests on guinea-pigs.

T. radicosum n.sp., isolated from the scalp of a 12-year-old Greek boy in Athens, forms on glucose agar a smooth, white growth not exceeding a pin's head in size, surrounded by an ill-defined zone of frosted aspect, with a whitish border or radiating, submerged hyphae. On maltose agar the central protuberance may attain a diameter of 2 mm., encircled by a smooth, greyish-white, irregular disk, 6 to 8 mm. in diameter. On rice agar the whitish, downy growth may reach a diameter of 6 to 8 mm. On agar media *T. radicosum* produces only arthrospores and chlamydospores, but on natural substrata *Acladium*-like conidiophores are frequently formed in profusion, bearing at fairly wide intervals piriform conidia, 4·5 to 5 by 2 to 2·5 μ. Guinea-pigs reacted positively to inoculation with the fungus.

T. glabrum var. *fuscinum* n.var., also originating in the scalp of a Greek child in Athens [ibid., xvi, p. 383], differs from the type species in the production on sugar-containing and natural media of a brown pigment. On natural media the *Acladium*-like conidiophores bear piri-

form conidia measuring 4·5 to 5 by 2 to 2·5μ. Negative results were given by inoculations on guinea-pigs.

PETGES (G.) & LECOULANT (P.). **Teigne d'origine africaine (région du Tchad) chez un enfant de 22 mois à parasite rappelant le "Microsporon ferrugineum d'Ota". Essai d'identification.** [Ringworm of African origin (Chad region) in a 22-month-old infant due to a parasite resembling Ota's *Microsporon ferrugineum*. An attempt at identification.]—*Ann. Derm. Syph., Paris,* Sér. 7, viii, 6, pp. 447–457, 7 figs., 1937.

Clinical details are given of a case of ringworm of the hair in a 22-month-old French boy, who contracted the disorder from native children in the Lake Chad region of Africa. Fragments of the affected hair, which was beaded with large, refringent spores, and squamae gave rise on Sabouraud's agar at 20° to 22° C. at first to a fine, whitish down, then successively to ochraceous-yellow to rust-coloured colonies with a markedly uneven, dry, contorted surface, and to the snow-white, pleomorphic woolly 'duvet'. Moniliform hyphae composed of unequal, elongated, rounded, ovoid, or elliptical segments were present. The pleomorphic 'duvet' consists of a regular, septate mycelium, some of the hyphae of which bear simple bunches of aleuria, while others present the phenomenon of protoplasmic resorption. The fungus presents interesting analogies both with *Trichophyton ochraceum* [*R.A.M.*, xv, p. 219] and more particularly with *Microsporon ferrugineum* [ibid., xv, pp. 501, 580].

EMMONS (C. W.) & CARRIÓN (A. L.). **Sporulation of the Phialophora type in Hormodendrum.**—*Mycologia*, xxix, 3, pp. 327–333, 6 figs., 1937.

Discussing the cause of chromoblastomycosis [*R.A.M.*, xv, p. 220] the authors state that the disease may be occasioned by any of three species of fungi, viz., *Phialophora verrucosa*, *Hormodendrum pedrosoi*, both long known as the commonest agents of the disease, and *H. compactum*, isolated from a single case in Porto Rico. The fungus named by Moore *Phialoconidiophora guggenheimia* [ibid., xvi, p. 251] is a typical strain of *H. pedrosoi* and the new name is another synonym of that species.

Sporulation in *H. pedrosoi* is more restricted than in saprophytic species of the genus and conidiophores of the *Phialophora* type occur but rarely [ibid., xv, p. 220] but are similar in every way to those of *P. verrucosa*. Sometimes a *Hormodendrum* spore in an otherwise normal head is transformed by the rupture of the end wall into a conidiophore of the *Phialophora* type. The series of changes by which such a transformation may take place are discussed and it is considered probable that *P. verrucosa* arose as a mutant from some species of *Hormodendrum*. Though in *Phialophora* the spores function as conidia the possibility that spores of this type are spermatia is not to be overlooked. For the present the authors recommend the retention of these fungi in *Hormodendrum* instead of transferring them to *Cladosporium*.

NIIZAWA (S.). **Ueber die Dermatomykosen in der Holonbail Gegend von Mandchuokuo.** [On the dermatomycoses in the Holonbail region of Manchukuo.]—*J. orient. Med.*, xxvi, 6, pp. 1175–1191, 1 pl., 11 figs., 1 map, 1937. [Japanese, with German summary.]

During a fortnight's stay in the Holonbail mountains of Manchukuo in 1935 the writer determined the causal organisms in 19 cases of dermatomycosis [cf. *R.A.M.*, xv, p. 501], viz., *Trichophyton violaceum* in 11, *T. purpureum* [ibid., xvi, p. 101] and *Microsporon japonicum* [ibid., xv, p. 459] in 3 each, and *T. glabrum* [ibid., xvi, p. 458] and *Epidermophyton inguinale* [*E. floccosum*: ibid., xvi, p. 316] in 1 each. Favus, mostly due to *Grubyella* [*Achorion*] *schoenleini* var. *mongolica* [ibid., xv, p. 501], is stated to be spreading in the region under observation.

KAMBAYASHI (T.). **Botanische Untersuchungen über japanische Fadenpilze, die auf der Menschenhaut parasitieren. III. Mitteilung. Über Cephalosporium nigrum nov. sp., isoliert von einer Dermatomycosis in Äthiopien.** [Botanical studies on Japanese Hyphomycetes parasitizing human skin. Note III. On *Cephalosporium nigrum* nov. sp., isolated from a dermatomycosis in Ethiopia.]—*Bot. Mag., Tokyo*, li, 606, pp. 436–444, 1 pl., 2 figs., 1937.

Cephalosporium nigrum n.sp., isolated from eruptions on the hands and legs of a Japanese temporarily residing at Addis Ababa, Abyssinia, forms on Sabouraud's glucose agar black, velvety, slightly raised, irregularly furcate colonies, with a whitish-grey centre and a narrow, semi-transparent peripheral zone of the same tinge. On potato the colonies are whitish-grey with a blackish centre. The fungus is characterized by hyphae 2 to 2·5 μ in diameter, and simple conidiophores, 20 to 38·5 by 2·5 μ, from the apices of which are abstricted up to eight or even twelve ovate to ellipsoid, hyaline conidia, 4·4 to 4·8 by 2·8 to 3·5 μ, aggregated into 'heads' 9·5 to 18 μ in diameter. Comparative studies of the new *Cephalosporium* [no Latin diagnosis of which is furnished] and eleven other species of the genus causing human dermatomycoses revealed a close affinity between *C. nigrum* and *C. stuehmeri* [*R.A.M.*, xiii, p. 238], the latter differing, however, in its reddish-brown colonies.

WEEDON (F. R.), SHIRK (MARIE E.), & KENNEY (DOROTHY). **Monilia albicans infection of the human gall bladder and biliary tract with report on three cases.**—Abs. in *J. Bact.*, xxxiii, 6, pp. 646–647, 1937.

Monilia [*Candida*] *albicans* [*R.A.M.*, xvi, p. 610] was detected by the writers in the bile of three out of 14 cases of typical gall-bladder disease and inoculated into rabbits with positive results.

AGOSTINI (ANGELA) & TREDICI (VINCENZINA). **Sopra una nuova specie di micete commensale (Phoma hominis Agostini et Tredici) isolato da forme cliniche del derma.** [On a new species of commensal fungus (*Phoma hominis* Agostini & Tredici) isolated from clinical conditions of the skin.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, ix, pp. 179–189, 5 figs., 1937. [Latin summary.]

A description is given of two strains of a species of *Phoma* isolated

from a dermatosis of the foot at Bari and one of the hand at Milan. In culture on Pollacci's medium and carrot the fungus formed a white, flocculent, later greyish, adherent mycelium and sparse, round, elliptical or irregularly oblong, yellowish to brown, ostiolate pycnidia, 80 to 350 μ in diameter, with hyaline, elliptical, ovate-elliptical, or round spores 2·5 to 12·5 μ in diameter. The elliptical, piriform, or oblong conidia of an *Alternaria* were also present either solitarily or arranged in short chains, measuring 25 to 60 by 5 to 13 μ. The fungus is named *Phoma hominis* n.sp. [cf. *P. conidiogena* on man: *R.A.M.*, xi, p. 374], the *Alternaria* stage being termed *A. hominis* n.sp., both with a Latin diagnosis. Inoculations of laboratory animals gave negative results and the fungus is regarded not as a causative but an aggravating factor in the dermatoses.

TRUNOFF (G. A.). Матеріали по фітопатологічному вивченню Конопель. [Contributions to the phytopathological study of Hemp.]—ex *Збірник наукових праць по Захисту Рослин* [Collection of scientific papers on Plant Protection], pp. 69–113, 13 figs., 3 graphs, 1 map. Держ. Видавн. Колгос. і Радгос. Літер. УССР. [Ukr. St. Publ. Off. Collect. Co-op. Fmg-Lit.], Kieff, 1936. [Received May, 1937.]

Field surveys from 1930 to 1933, inclusive, showed that the more important fungal diseases of hemp [*Cannabis sativa*] in the Ukraine are a stem spot, the causal organism of which is stated to be *Dendrophoma marconii* [*R.A.M.*, xv, p. 97] in association with a number of saprophytic fungi, and white and grey rots due to *Sclerotinia libertiana* [*S. sclerotiorum*: loc. cit.] and *Botrytis cinerea* [ibid., xiii, p. 377], respectively. Observations in 1930 indicated that the stem spot originates and develops chiefly on the male hemp plants, the infection spreading during vegetation from these to the female plants. It was experimentally shown that removal of the male plants from the fields as early as possible after the completion of pollination significantly reduced the incidence of the disease and also the damage done to the technical qualities of the fibre. *B. cinerea* attacks chiefly the middle and apical portions of the stems and inflorescences. In one locality in 1931 *Diplodina cannabina* was found to cause a wet stem rot of hemp in the field. In the former Proskuroff district up to 23·5 per cent. of the crops were damaged by *Cladosporium herbarum*, which caused a brown discoloration of the fibres, considerably reducing their commercial value. An average of 21·8 per cent. of the hemp plants in three localities were observed to be attacked by *Hypochnus* [*Corticium*] *solani*, a new record on this host; the fungus apparently did not interfere with the development of the plant, but formed a whitish efflorescence of *C. solani* spores at the collar. The leaf diseases mentioned include brown spot (*Phyllosticta cannabis*) [ibid., xi, p. 745], *Septoria cannabis* [ibid., xv, p. 805], downy mildew (*Pseudoperonospora cannabina*) [ibid., xv, p. 97], and a small, dark brown to black, interveinal spotting, occurring especially on Italian hemp varieties, caused by an undetermined bacterium. None of these leaf diseases is of economic importance, but the downy mildew has potentialities for damage.

Bohovik (I. V.). Хвороби нових олійних культур на Україні. [Diseases of the newly introduced oleiferous crops in the Ukraine.] —ex *Збірник наукових праць по Захисту Рослин* [*Collection of scientific papers on Plant Protection*], pp. 114–123, 5 figs. Держ. Видавн. Колгос. і Радгос. Літер. УССР [Ukr. St. Publ. Off. Collect. Co-op. Fmg-Lit.], Kieff, 1936. [Received May, 1937.]

The results of a phytopathological survey in 1934 of the oleiferous plants which have recently been introduced for intensive cultivation in the Ukraine showed the presence on them of the following parasitic diseases. Castor bean (*Ricinus communis*) suffers chiefly from grey rot (*Botrytis cinerea*) of the inflorescences; the greatest damage was done to the varieties with dense, compact racemes, and one Siberian (Priamurski) variety with loose bunches was apparently completely immune. Bacterial wilt (*Bacterium solanacearum*) [*R.A.M.*, xiii, p. 659; xv, p. 539] was met with only occasionally.

The most severe diseases of sesame (*Sesamum indicum*) are a bacterial leaf spot, a bacterial wet rot of the stem, and a bacterial brown spot of the fruit capsules, the causal organisms of which have not yet been identified; the troubles were most destructive in dense stands and in plots which were not surface-hoed during the growing period; of the 13 sesame varieties tested, Kruglik No. 1 alone appeared to be immune, and DSN showed 12·5 per cent. infection, all the remainder being highly susceptible (70·4 to 100 per cent. infection). A slight outbreak of a whitish, rounded or irregular leaf spot with a brown margin, up to 1 cm. in diameter, was observed for the first time in one locality; the causal organism is stated to be *Phyllosticta sesami* Bohovik, which has emergent, brown, mostly globose pycnidia, 30 to 100 μ in diameter, and hyaline, continuous, elongated pycnospores, rounded at both ends and 6 to 13 by 2 to 4 μ. The minor diseases of sesame include a wilt associated with a species of *Fusarium*, and a leaf spot caused by a species of *Macrosporium* morphologically corresponding to Sawada's description of *M. sesami* [ibid., xi, p. 350].

Considerable damage to groundnut (*Arachis hypogea*) and safflower (*Carthamus tinctorius*) was caused by grey rot of the inflorescences (*Botrytis cinerea*). In one locality an apparently hitherto unrecorded disease was observed on the groundnut, characterized by the presence, chiefly on the top leaves, of rounded or irregular, brown spots with a darker margin and a light centre, frequently coalescing; the affected leaves become chlorotic and die prematurely. The disease is caused by an unidentified species of *Alternaria*, and may eventually prove of economic importance, since its incidence in the affected fields varied from 58 to 93 per cent., with an average intensity of 2 of the 3 marks scale. A condition of the groundnut strongly reminiscent of 'rosette' [ibid., xv, p. 426] was occasionally found in two localities.

Drayton (F. L.). **The perfect stage of Botrytis convoluta.**—*Mycologia*, xxix, 3, pp. 305–318, 9 figs., 1937.

The writer records the development in culture of the apothecial stage of *Botrytis convoluta* [*R.A.M.*, xii, p. 292], the cause of the rhizome rot of *Iris*. The eight isolates used in the study were obtained from Germany,

France, Canada, and United States (5 strains), and were identical except for slight differences in readiness to sporulate and in the size of sclerotia produced. To obtain sclerotia that will later produce apothecia the author recommends the use of wheat grain (8 gm.) in distilled water (25 c.c.) per Petri dish [ibid., xiii, p. 461], and incubation at 14° C. in darkness for 45 days. The sclerotial groups are then removed and placed in preparation dishes on moist sand at 0° in darkness for 3 or 4 months; after that they are spermatized with microconidia and kept at 5° for about five weeks. Apothecial fundaments begin to appear during the period at 0° and their production is greatly accelerated at 5°. When they reach about 2 or 3 mm. in length the dishes are transferred to the greenhouse and placed under cheesecloth. The apothecia mature in about four weeks. If the cultures are subjected to light during the 45 day period at 14° the sclerotia produce conidiophores and conidia.

No distinctive receptive structures were recognized in this fungus and great difficulty was experienced in knowing when spermatization should be done. Some evidence was obtained that the protruding apothecial initials which emerge after the period of rest at 0° constitute the receptive structures.

The apothecial stage is named *Sclerotinia convoluta* sp. nov. with a diagnosis in English and Latin. The apothecia are infundibuliform to cyathiform becoming discoid, stipitate, 3 to 6·25 mm. high, with disks 2·5 to 4 mm. in diameter. The asci are cylindrical, 150 to 195 by 9 to 13 μ, with 8 uniseriate, ellipsoid, hyaline, continuous ascospores, 11·7 to 19·5 by 5·2 to 9·1 μ (mode 14·3 to 15·6 by 6·5 to 7·8 μ). Paraphyses are abundant, filiform, septate, hyaline, 2·5 to 3 μ in diameter, occasionally wider at the apex.

Mehlisch (K.). **Einige Blattfleckenkrankheiten.** [Some leaf spot diseases.]—*Blumen- u. PflBau ver. Gartenwelt,* xli, 25, p. 286, 1 fig., 1937.

Recommendations are made in these popular notes for the control of *Heterosporium echinulatum* [*Didymellina dianthi*: *R.A.M.*, xvi, p. 255] on carnation leaves by the use of healthy propagating material, supplemented if necessary by the repeated treatment of the cuttings with uspulun and the application to the older plants of 1 per cent. Bordeaux mixture.

H. syringae causes a relatively innocuous disease of lilac in the shape of a well-marked greyish-brown discoloration of the foliage in the autumn. Bordeaux mixture gives satisfactory control.

H. gracile [*D. macrospora*] is responsible for a widespread leaf blight of iris [ibid., xvi, p. 463], narcissi, and gladioli, the foliage shrivelling from the tip downwards. *Iris foetida* is particularly susceptible, *I. pumila* almost immune. Soft soap (2·5 kg. per 100 l.) should be added to the Bordeaux mixture to secure adhesion to the smooth leaves of these plants.

Rainio (A. J.). **Disease of Gladiolus caused by Bacillus variegatus Rainio n. sp.**—*Ann. bot. Vanamo,* vi (*1935–1936*), 8, pp. 3–7, 5 figs., 1936. [Received 1937.]

This is an abridged account of the gladiolus disease caused by

Bacillus variegatus n.sp. in Finland, a fuller version of which from another source has already been noticed [*R.A.M.*, xvi, p. 180].

Två svårartade sjukdomar hos odlade Liljor. Mosaiksjuka och Liliegråmögel. [Two destructive diseases of cultivated Lilies. Mosaic disease and grey mould.]—*Flygbl. Växtskyddsanst., Stockh.*, 32, 5 pp., 2 figs., 1937.

Popular notes are given on the only two diseases causing appreciable damage to cultivated lilies in Sweden, namely, mosaic [*R.A.M.*, xvi, p. 615] and grey mould (*Botrytis elliptica*) [ibid., xv, p. 507]. The former was first observed in 1932 on *Lilium candidum* and subsequently found to be widespread on *L. longiflorum*, while recent specimens submitted to the Experiment Station for examination include the imported *L. giganteum*, *L. formosum*, and other varieties. A few *L. longiflorum* plants from Bermuda have also been found to show rosette [ibid., xv, p. 444] symptoms. *B. elliptica* is particularly destructive on outdoor plants during hot summer weather, causing leaf, flower, and stem decay, infection being favoured by atmospheric humidity and abrupt changes of temperature.

Pirone (P. P.). **A new disease of Marigolds.**—*Flor. Exch.*, lxxxviii, 6, p. 52, 3 figs., 1937.

A new disease of marigold characterized by blackening and shrivelling of the stem near the soil-level followed by severe wilting, destroyed several outdoor plantings in the vicinity of New York in the summer of 1936, the symptoms becoming conspicuous after the plants had reached a height of a foot or more, death rapidly ensuing. The roots of diseased plants were almost completely decayed. The disease is attributed to *Phytophthora cryptogea* not hitherto reported as a disease of marigolds. Greenhouse tests showed that the variety Guinea Gold is most readily attacked, but all the African types [*Tagetes erecta*] are susceptible, while dwarf and French [*T. patula*] marigolds are resistant. The fungus was also found to be capable of causing seed decay and damping-off of seedlings in the greenhouse. For control, soil sterilization by steam is recommended, or failing that disinfection with formaldehyde. Diseased material should be removed and burnt.

Hassebrauk (K.). **Zur Frage der Verbreitung des Löwenmaulrostes durch das Saatgut.** [On the question of the spread of Snapdragon rust by means of the seed.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 23, pp. 261–262, 1937.

The possibility of seed transmission of snapdragon [*Antirrhinum majus*] rust (*Puccinia antirrhini*) [*R.A.M.*, xvi, p. 679] is refuted by the writer on the grounds of the short life of the uredospores, the inability of sporidia produced by the teleutospores to cause infection, and the lack of evidence of a perennating mycelium. Healthy plants have been raised from heavily infected seed, which may safely be used for propagation provided strict precautions are observed against the mechanical dissemination of the spores to existing plants.

KLAUS (H.). **Zur Bekämpfung des Chrysanthemum-Rostes.**—[On the control of Chrysanthemum rust.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 26, p. 294, 1937.

Spring and autumn applications of copper or sulphur fungicides, combined with the prompt removal and destruction of infected material, are urgently recommended for the control of chrysanthemum rust (*Puccinia chrysanthemi*) in the Berlin district [*R.A.M.*, xvi, p. 677], where the neglect of these precautions is stated to be causing heavy losses among the valuable Converse, Mona Davis, Brooks, Turner, and other varieties.

SCHMIDT (H.). **Das Asternsterben.** [The dying-off of Asters.]—*Kranke Pflanze*, xiv, 5, pp. 89–90, 2 figs., 1937.

A popular note is given on the dying-off of summer asters [*Callistephus chinensis*] in Germany caused by *Fusarium* spp. [*R.A.M.*, xiv, p. 172; cf. ibid., xvi, p. 256]. The diseased stems frequently rupture and masses of the white or pink *Fusarium* spores may be detected in the cracks, the proximity of some of which to the flowers may well lead to seed infection. Wilting is commonly not observed until shortly before or during flowering, but seedlings may also be affected; in mild cases no external symptoms may appear unless environmental conditions, e.g., rapidly rising temperatures, are conducive to outbreaks of the disease. Control of dying-off after its development being impracticable, strict attention should be paid to the prevention of the trouble by seed treatment with uspulun or ceresan (liquid or dust), steam sterilization of the propagating beds, change of planting sites, sparse nitrogenous manuring, and burning or deep burying of infected refuse.

MORWOOD (R. B.). **Paspalum ergot.**—*Qd agric. J.*, xlvii, 5, pp. 478–479, 1937.

Ergot of *Paspalum* [*dilatatum*: *Claviceps paspali*: *R.A.M.*, xv, p. 809], the widespread occurrence of which in Queensland is liable to cause sickness among stock, may be held in check by a system of intensive rotational grazing to prevent sclerotial formation on the seed heads. Mowing and a rapid firing of the cut grass will also assist in the temporary eradication of the disease, but in severe cases burning over may be necessary; if these measures fail the substitution of some other suitable grass for *P. dilatatum* should be considered.

WEIMER (J. L.). **The possibility of insect transmission of Alfalfa dwarf.**—*Phytopathology*, xxvii, 6, pp. 697–702, 1937.

Field observations in California having indicated the possibility of the transmission of lucerne dwarf [*R.A.M.*, xvi, p. 103] by insects, plants growing in proximity to infected ones were caged and found to remain free from the disease while uncaged plants contracted it. In preliminary experiments under controlled conditions, however, none of the insects tested communicated dwarf from diseased to healthy plants.

NOVIKOFF (V. A.). **Derangement of metabolism in the leaves of Lucerne when infected with the rust Uromyces striatus Schröt.**—*C. R. Acad. Sci. U.R.S.S.*, xv, 1, pp. 53–56, 1937.

The results of the biochemical studies discussed in this paper showed that infection of lucerne with rust (*Uromyces striatus*) [*R.A.M.*, xiii, p. 290] reduces the content of the host in carbohydrates, in total nitrogen, in protein and non-protein nitrogen (possibly by the conversion of combined nitrogen into gaseous nitrogen which escapes from the leaves), and in cellulose (to an amount almost equal to the increase in the hemicellulose content); the infected leaves were also found to contain an unknown sugar, which was usually absent from healthy leaves. These results are considered to indicate that the rust not only reduces the food value of lucerne, but also decreases its capacity of enriching the soil in nitrogen; it is therefore a serious source of loss and should be given greater attention than it usually receives.

BAUDYŠ (E.). **Rakovina Jetele a jiné choroby a škůdci Jetelin.** [Clover rot and other diseases and pests of Clovers.]—*Čes. odbor zem. rady morav. v Brně* [*Czech Sect. Moravian Bd Agric. Brno*], *Leaflet* 53, 4 pp., 6 figs. [Not dated. Received June, 1937.]

This is a semi-popular account of the diseases and pests of clovers and lucerne in Czecho-Slovakia, together with a discussion of the best measures for their control. Among the diseases of clovers mentioned clover rot (*Sclerotinia trifoliorum*) [*R.A.M.*, xv, p. 725] and anthracnose (*Kabatiella caulivora*) [ibid., xiv, p. 241] are the most important, the former also attacking lucerne, sainfoin [*Onobrychis sativa*], and certain other Papilionaceae, while other agents are *Mitrula sclerotiorum* [ibid., xv, p. 725], *Typhula trifolii* [ibid., xvi, p. 388], and, on the seed, *Macrosporium* [*Thyrospora*] *sarcinaeforme* [ibid., xvi, p. 616], *Botrytis cinerea*, and *Aplanobacter insidiosum* [ibid., xv, p. 586]; *Pseudomonas* [*Bacterium*] *medicaginis* [ibid., xv, p. 258] occurs on lucerne seed from America. Red clover [*Trifolium pratense*] is frequently attacked in the spring, after the disappearance of the snow cover, by *Fusarium trifolii* [ibid., xi, p. 624], which causes a black discoloration of the collar tissues and a premature withering of the foliage spreading in discrete, rounded patches in the field. *A. insidiosum*, *F. oxysporum* var. *medicaginis*, *Stagonospora meliloti* [ibid., xv, p. 632], and *Pseudopeziza medicaginis* [ibid., xiv, p. 424] occur on lucerne and *Phyllachora lathyri* on sainfoin. Since many of the diseases are seed-borne, it is recommended that clover seeds should be disinfected before sowing either by steeping for 8 to 10 minutes in 0·2 per cent. mercuric chloride or better still for one hour in 0·25 per cent. germisan [ibid., xv, p. 373].

CHANDLER (W. H.). **Zinc as a nutrient for plants.**—*Bot. Gaz.*, xcviii, 4, pp. 625–646, 5 figs., 1937.

This is a summary, supplemented by critical observations, of the problem of the zinc requirements of higher plants and fungi. Much of the work on which the review is based, including the studies conducted by the writer and his colleagues on little leaf or rosette of fruit trees in California, has already been noticed [*R.A.M.*, xvi, p. 682 and next

abstract]. The role of zinc is not known, but is thought to act as a catalytic agent in some essential reaction.

THOMAS (H. EARL). **Rosette or little leaf of fruit trees.**—*Phytopathology*, xxvii, 6, pp. 727–729, 1937.

In connexion with the discussion proceeding between Chandler and Hoagland on the one hand, and Kozlowski on the other, as to the etiology of rosette or little leaf of fruit trees in California [*R.A.M.*, xvi, p. 259], the writer briefly summarizes the available information on this problem from which it is inferred, in agreement with the first-named workers, that zinc deficiency is the primary cause of the condition.

FIKRY (A.). **Water-table effects. III. Further studies on relative incidence of diseases on stone-fruit trees.**—*Bull. Minist. Agric., Egypt*, 181, 12 pp., 4 graphs, 1937.

In further studies [*R.A.M.*, xv, p. 590] on the effect of varying heights of the sub-soil water table on the physiological gumming disease affecting plums, peaches, and apricots in Egypt, as well as shot hole [*Clasterosporium carpophilum*] and rust [*Puccinia pruni-spinosae*: ibid., xvi, p. 474] of these hosts carried out at Dokki near Cairo from 1932 to 1935, inclusive, the results obtained confirmed the previous findings. All three diseases severely affected trees in low-lying situations, but only lightly attacked those at higher elevations, where yield and growth were also much better than on the low ground.

In 1935, when the Nile floods were exceptionally high, a large proportion of the plum trees belonging to varieties susceptible to the gumming disorder were killed off in low-lying land at the Nile Delta Barrage, though resistant varieties remained healthy. Numerous peach trees on low-lying land in the Mit Ghamr district (Delta) were also killed by the disorder, though others at higher levels were unaffected.

VOLOSHINOVA (Mme B. A.). Результати обслідування розсадників України на зараженість їх гуглюватістю коріння (кореневий рак) плодових дерев. [The results of a survey of tree nurseries in the Ukraine to determine their infection with crown gall (root canker) of fruit trees.]—ex. *Збірник наукових праць по Захисту Рослин* [*Collection of scientific papers on Plant Protection*], pp. 124–134, 1 map, Держ. Видавн. Колгос. і Радгос. Літер. УССР. [Ukr. St. Publ. Off. Collect. Co-op. Fmg-Lit.], Kieff, 1936. [Received May, 1937.]

A brief tabulated account is given of investigations in 1931, the results of which showed that crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) is widespread in the Ukraine on all kinds of fruit trees [cf. *R.A.M.*, xii, p. 516], with a marked tendency of recent years to gain further ground. In the author's opinion the spread of the disease may be checked by certain cultural and quarantine measures, including prohibition of the growing of stock seedlings on the same soil for more than two years, and the adoption of a crop rotation period of at least six years. Since soil appears to be the main source of infection, nurseries showing over 15 per cent. infection among their stocks should be closed

down, and strict supervision should be maintained of other nurseries to ensure that no diseased seedlings are dispatched.

WORMALD (H.) & HARRIS (R. V.). **Notes on plant diseases in 1936.**—*Rep. E. Malling Res. Sta., 1936*, pp. 187–193, 1 pl., 1937.

This account of plant diseases investigated at East Malling in 1936 [*R.A.M.*, xv, p. 703] contains, among others, the following items of interest. *Nectria cinnabarina* [ibid., xv, p. 303] was associated with a canker of apple near Colchester. Some evidence was obtained that apple scions worked on East Malling rootstock XVI are more susceptible to *Podosphaera leucotricha* than apples on certain other rootstocks. *Verticillium dahliae* [ibid., xii, p. 488] was isolated from the main stems of quince stocks, Malling type C, on which pears were grafted; under 1 per cent. of the trees were killed by the infection. A wilt of the shoots in layer rows of plums, cherries, and peaches, which was first noticed in 1932 but became much more serious in 1935 and 1936, was associated with *Cylindrocladium scoparium* [ibid., x, p. 792]. Lesions a few inches long developed on the underground part of the shoot, which they subsequently girdled, causing the leaves to droop and wither. A comparison of the fungus with a culture of *C. scoparium* obtained from rose in America showed the two organisms to have different growth habits. Boskoop Giant black currants were almost defoliated as a result of infection by *Pseudopeziza ribis* [ibid., xv, p. 448]; the Baldwin variety was less affected, Seabrooks still more mildly, and Goliath was the most resistant of all.

In many districts heavy losses were caused among plums and cherries by bacteriosis (*Pseudomonas mors-prunorum*) [ibid., xvi, p. 691]; the disease was newly recorded from Northern Ireland, where it occurred on Victoria plums.

The bacterial leaf spot of Morello cherries reported in 1935 [ibid., xv, p. 703] was much less severe.

An organism which appeared to be related to *Pseudomonas prunicola* was isolated from Catillac pear spurs bearing withered flowers and from spotted Fertility pear fruits; inoculations of pear fruits with the organism obtained from the flowers and fruits gave lesions in both cases.

BAUDYŠ (E.). **Hniloba Jablek od jadřince.**—[Rotting of Apples from the core.]—*Čes. odbor zem. rady morav. v Brně* [*Czech Sect. Moravian Bd Agric. Brno*], *Leaflet* 57, 3 pp., 5 figs., 1937.

The author states that soils deficient in potassium induce the calyx end of apples grown on such soil usually to remain open, especially in varieties in which the calyx end is deeply sunk, and thus affords easy passage to the core for the spores of numerous fungi causing core rots in storage [*R.A.M.*, xvi, p. 688], such as *Fusarium avenaceum* (numerically the most important of the rotting organisms), *F. scirpi* var. *acuminatum*, *F. oxysporum* var. *aurantiacum* [ibid., xvi, p. 323], different species of *Cylindrocarpon* and of *Pestalozzia*, and others. A brief account is also given of apple rots caused in Czecho-Slovakia by other fungi [ibid., x, p. 253], namely, *Trichothecium roseum*, *Gloeosporium fructigenum* [*Glomerella cingulata*], *Gloeosporium album* [ibid., xv, p. 555], *Nectria galligena* [ibid., xvi, p. 324], *Penicillium crustaceum* [ibid., xii,

p. 377], *Aspergillus glaucus*, and *Botrytis cinerea*. A brief mention is made of a physiological brown spot of market apples, which was very frequently observed in 1936, especially in fruit imported from Rumania, the cause of which is ascribed to excessive fertilization of the soil with nitrogenous manure. This condition may be remedied by dressing the soil with potassium salts and superphosphate.

Some diseases of Apples.—*Mysore agric. Cal., 1937*, pp. 25, 33, 2 pl., 1937.

Diseases of apples have become so serious round Bangalore, India, as to threaten the cultivation of the crop. The most important is root rot due to *Sclerotium rolfsii* [*R.A.M.*, xvi, p. 262] causing the wilting and death of the tree. In addition to removing and destroying all affected plants, the roots of those remaining should be laid bare as far as possible and sprayed with 1 per cent. Bordeaux mixture. Spraying is stated to have given very good results over a number of years.

Stem rot characterized by cankers on the main stem and branches, often accompained with a dark brown exudate, is associated with *Schizophyllum* [*commune*: ibid., xvi, p. 106]. Infection probably takes place through broken twigs or through the stumps of the stocks remaining after budding. Affected trees ultimately die. Wounds should be protected by white lead paste or other dressing, and the stems whitewashed to prevent cracking from the sun.

Powdery mildew [? *Podosphaera leucotricha*] is common after the rains and first flush of growth; it can easily be controlled by spraying with 1 per cent. Bordeaux mixture with an adhesive.

Ruehle (G. D.). **Fungi which cause decay of Apples in cold storage.**—*Res. Stud. St. Coll. Wash.*, v, 2, pp. 99–100, 1937.

This is a condensed account of the writer's studies (1926 to 1929) on the fungi, especially *Penicillium expansum*, implicated in the decay of apples in cold storage in Washington, fuller versions of which have been noticed from other sources [*R.A.M.*, xi, p. 309; cf. ibid., xv, p. 733; xvi, p. 259].

Harding (P. L.), Lutz (J. M.), & Rose (D. H.). **Influence of packing and handling methods on condition of Apples barreled for export.**—*Tech. Bull. U.S. Dep. Agric.* 559, 25 pp., 7 figs., 1937.

Apples dispatched from the United States in barrels are stated frequently to reach European markets in an unsatisfactory condition, slackness of pack due to improper fitting, breakdown, and decay resulting from skin breaks being probably the most serious defects. Investigations were accordingly carried out from 1931 to 1934, inclusive, to devise methods of packing calculated to reduce this loss, using York Imperial apples in 1931, Rome Beauty in 1932, Jonathan in 1933, and Grimes Golden in 1934.

A summary of the results [which are discussed and tabulated] shows that shaking the barrels two or three times during filling, 'racking' (vigorously jolting the barrels backwards and forwards when nearly full) 15 times, with the 'plug' or 'follower' (a heavy canvas-covered wood or metal disk fitting easily inside the barrel to assist in settling

the fruit) in place, and filling to about ¾ in. above the top of the staves, sufficed to obviate appreciable settling of the apples. In the York Imperial tests it was observed that over-filling of the barrels tends to increase the amount of slackness by causing the skin breaks that pave the way for decay organisms. Slightly less bruising was induced by 'ring-tailing' than by 'jumble-tailing' the apples, and barrels headed with the machine press contained fewer badly bruised fruits than those on which a hand-operated screw press was used. The incidence of decay in the Rome Beauty barrels was not excessive, owing to the comparatively cool weather prevailing during the test. In Jonathans no slackness was found in barrels shaken when one-third and two-thirds full and racked 15 times when nearly full, and additional shaking and racking increased decay and skin breaks slightly. Barrels subjected to the extra rough handling liable to occur on board ship sustained heavy damage in the form of severe bruising, skin breaks, and decay. The relatively high percentage of bruising noted on Grimes Golden is attributed to the prominence of such defects on the pale colour of the fruit in contrast to the deeper tints of Rome Beauty and Jonathan. From about 12 to 14 per cent. of the skin breaks were found to be due to stem punctures, between which and the amount of shaking, racking, or height of pack, there was, however, no apparent correlation.

WORMALD (H.). **The sooty blotch disease of Apples and Plums.**—*Rep. E. Malling Res. Sta., 1936*, pp. 194–197, 1 pl., 1937.

Sooty blotch (*Gloeodes pomigena*) [*R.A.M.*, xv, pp. 665, 666; xvi, p. 21] was very prevalent on apples in many parts of England in 1936, and caused serious infection of some plum varieties at East Malling, including Warwickshire Drooper (on which some 90 per cent. of the fruits were affected), Pershore Egg, Victoria, Pond's Seedling, Cambridge Gage, and Giant Prune. Satisfactory results were given in a small-scale test on control, using plums and apples, by the method recommended by Miss Bottomley [ibid., xiv, p. 452], i.e., a one-minute dip in 5 per cent. bleaching powder, followed by ten minutes' exposure to the air, washing, and drying. Small quantities of affected apples can be satisfactorily cleansed by rubbing with a damp cloth.

IVANOFF (S. S.) & KEITT (G. W.). **The occurrence of aerial bacterial strands on blossoms, fruits, and shoots blighted by Erwinia amylovora.**—*Phytopathology*, xxvii, 6, pp. 702–709, 2 figs., 1937.

This is an expanded account of the occurrence of aerial bacterial strands on pear pedicels, shoots, and fruits blighted by *Erwinia amylovora* in Wisconsin, a note on which has already appeared [*R.A.M.*, xvi, p. 473]. The strands are a fraction of a millimetre to several centimetres in length and 8 to 45μ wide. The bacteria of which they are composed remain viable for over seven days.

ENGEL (L.). **Vorzeitiger Blattfall bei Birnenwildlingen.** [Premature defoliation in free Pear stocks.]—*Blumen- u. PflBlau ver. Gartenwelt*, xli, 26, p. 300, 1937.

In German nurseries leaves of free quince and pear stocks infected by *Stigmatea mespili* [*Fabraea maculata*: *R.A.M.*, xv, p. 427; xvi,

p. 327] shrivel and fall prematurely, with the result that the plants fail to make proper growth and the cortex is not detachable for grafting purposes. Young shoots are also liable to attack. Repeated applications of 1 per cent. Bordeaux mixture and the burning of the diseased foliage in the autumn are recommended.

GONÇALVES (R. D.). **A entomosporiose ou mancha das folhas e fructas do Marmelleiro.** [Entomosporiosis or leaf and fruit spot of the Quince.]—*Biologico*, iii, 6, p. 183, 1937.

Fabraea maculata [see preceding abstract], in its imperfect stage (*Entomosporium maculatum*), is stated to be widespread in the State of São Paulo, Brazil, on the quince, and also on apple, pear, and other Pomaceae. On the first-named host it not only attacks the leaves, but also the fruit, causing cracking and deformation. Under local conditions periodical spraying of the trees, starting from the opening of the buds, with lime-sulphur (1 in 50) appears to give better control of the disease than spraying with Bordeaux mixture. The removal and burning of all infected material is recommended as an effective prophylactic measure.

WORMALD (H.) & PAINTER (A. C.). **Further observations on brown rot of Plums in cold storage.**—*Rep. E. Malling Res. Sta., 1936*, pp. 198–200, 1 pl., 1937.

When Victoria and Giant Prune plums and Bradley's King damsons were kept in cold storage at about 35° to 37° F. for periods ranging from 12 to 34 days (some lots being accidentally exposed to between 38° and 42° for part of the time) wastage in the plums was due to the same fungi as in 1934 [*R.A.M.*, xiv, p. 641], *Sclerotinia fructigena* predominating, and *S. laxa* being present on a few of the fruits, alone or accompanied by the former, while some of the plums showed the presence of *Botrytis cinerea*, a species of *Mucor*, and a *Penicillium*. *S. fructigena* and *S. laxa* were approximately equally active on damsons in storage.

HIGGINS (B. B.) & WOLF (F. A.). **Frosty mildew of Peach.**—*Phytopathology*, xxvii, 6, pp. 690–696, 1 fig., 1937.

Studies were made in North Carolina and Georgia on the morphology and life-cycle of *Cercosporella persicae* Sacc. (syn. *Cercospora persica* Sacc., *Clasterosporium persicum* (Sacc.) Tsugi) the agent of frosty mildew of peaches [*R.A.M.*, vii, p. 176], a widespread pathogen in neglected orchards throughout the United States, Europe, and the East. The disease first appears in June in the form of white, later yellowish powdery patches of irregular extent on the leaves, which are prematurely shed. In addition to the conidial stage, the fungus was observed to produce spermogonia and perithecia, necessitating its transference to *Mycosphaerella* as a new species, *M. persica*, a Latin diagnosis of which is furnished.

The hyaline, vermicular to clavate, pluriseptate conidia, 17 to 86 by 2·5 to 7μ, are abstricted from the apex of short, knob-like conidio-

phores branching laterally from the mycelium. The black, erumpent, densely aggregated, globose perithecia measure 75 to 110 by 60 to 106μ in diameter and are provided with a papilliform or obtusely conical ostiole and a thin, dark brown, membranaceous wall. The cylindrical to clavate, shortly stipitate, fasciculate, aparaphysate asci measure 36 to 55 by 7 to 10μ and contain eight distichous, straight or curved, unequally septate, hyaline ascospores, 12 to 20 by 2·5 to 3·5μ. The ovate or globose, black spermogonia, 48 to 72 by 52 to 91μ, formed in profusion in the autumn in the fallen leaf tissues, are occupied by bacilliform, hyaline spermatia, 2·5 to 4 by 0·5μ. Spermatial production ceases after about two months, and the perithecia do not mature until the following spring.

The genetic connexion between the familiar imperfect stage and the ascigerous phase of *M. persica* was demonstrated by cultures and by inoculation experiments on Elberta and Belle of Georgia peach trees. Conidia were produced in abundance in three- to four-day-old cultures arising either from conidia or ascospores. Three weeks after inoculation with conidial suspensions either from diseased leaves collected in the orchard or from conidial or ascospore cultures, the foliage developed the typical whitish lesions of the *Cercosporella* stage. In another test, using an aqueous conidial suspension from a single ascospore culture, heavy infection developed after about five weeks on 37 out of 50 leaves, which also produced spermogonia and perithecia in the following autumn. No infection occurred on the uninoculated control leaves. At the same time, fragments of overwintered peach leaves bearing mature perithecia were bound to the lower surface of 32 field-grown peach seedlings not infected during the previous year, of which 20 contracted typical frosty mildew.

HILDEBRAND (A. A.). **Strawberry root-rot in Ontario.**—Reprinted from *Canad. Hort. & Home Mag., 1937*, 7 pp., 1937.

Recent surveys in Ontario have revealed outstanding cases in which strawberry root rot or black root [*R.A.M.*, xv, p. 449; xvi, p. 623] originally appeared in and spread from low-lying parts of a plantation. Both soil moisture and soil temperature have an important bearing on the disease, as well as soil organisms, and in certain recent experiments at St. Catharines it was shown that when strawberry plants were grown at 44° to 48° F. in root-rot soil adjusted to contain 60 per cent. of its maximum water content, the root systems remained healthy, though when the soil temperature and moisture were increased the disease appeared and gradually became more severe with increasing temperature and moisture, until plants set in the soil at 60° and 80 per cent. moisture died within a week. Even at the most favourable temperatures plants in wet soil were very adversely affected.

Growers are advised to purchase good quality stock. The plants should be rinsed in water and examined carefully before being set out, all weaklings and plants with roots showing a brownish discoloration being discarded. The soil must be well-drained, and attention should be paid to the nutritional requirements of the plants. It is believed that crop rotation and the ploughing under of green manure may offer an effective means of control.

HARRIS (R. V.) & HILDEBRAND (A. A.). **An investigation of Strawberry virus disease in Ontario.**—*Canad. J. Res.*, xv, 6, pp. 252–280, 4 pl., 4 diags., 1937.

In 1933, symptoms of a strawberry disease analogous to those of yellow edge in England [*R.A.M.*, xv, pp. 732, 817] were observed in Ontario on the Parson's Beauty variety both in the field and in the greenhouse, and on one plant of the Forward variety in the greenhouse, but only for a limited period early in the growing season, and in no case so clearly pronounced, especially as regards the marginal chlorosis, as in England. In experiments, started the same year, at St. Catharines, Ontario [a detailed account of which is given], 'normal' Royal Sovereign plants, obtained from a clone which had been minutely rogued for yellow edge in England, were used as indicators for the presence of yellow edge in the Canadian varieties. Transmission trials (by runner grafting) resulted in the development in the Royal Sovereign plants of symptoms, macroscopically indistinguishable from typical yellow edge, from the local varieties Glen Mary, Parson's Beauty, and Premier, which were also shown to possess to a marked degree the capacity of being symptomless carriers of the virus. No diagnostic symptoms whatever were observed on the Premier variety, some plants of which, however, do not carry the virus at all. Supplementary experiments in 1935–6 at East Malling Station (a full report of which is reserved for future publication) showed that of the two parent *Fragaria* species common to commercial varieties in North America and England, *F. chiloense* is highly tolerant to yellow edge virus, all the test plants being found infected without manifesting any outward symptoms, while *F. virginiana* is highly susceptible and exhibits the symptoms with extreme readiness and persistency. Some explanation of the wide range of varietal reaction to disease of the yellow edge type is thus provided. The results of the experiments also showed that a large proportion of the plants of the 'normal' Royal Sovereign clone used as indicators in the experiments was infected with a distinct virus of the crinkle type [ibid., xiii, p. 642; xiv, p. 288], which may explain the fact that in certain graft series in St. Catharines the Premier components showed deterioration suggesting reciprocal infection between it and the Royal Sovereign component.

HARRIS (R. V.). **Virus diseases in relation to Strawberry cultivation in Great Britain—a synopsis of recent experiments at East Malling.**—*Rep. E. Malling Res. Sta., 1936*, pp. 201–211, 1 pl., 1 diag., 1937.

In this account of investigations carried out since 1927 at East Malling, Kent, into virus diseases of strawberries, with special reference to their effect on varietal deterioration, the author states that the results of tests on the indicator plant *Fragaria vesca* demonstrated that crinkle [see preceding abstract] is widely distributed in England, mainly in a very mild form, throughout the available stock of healthy (yellow edge free) Royal Sovereign plants, and is constantly associated with yellow edge [loc. cit.] in the sense that all yellow-edge plants examined also showed minute traces of mild crinkle. In 1935 and 1936 the incidence of severe crinkle, similar to that observed in the south-west of England, was found to be increasing, though not frequent, and experiments showed that

this form is indicated by the additional infection of mildly crinkled plants by a further virus. The most salient distinction between the symptoms of crinkle and yellow edge is that in crinkle the chlorosis is localized in minute, unevenly distributed circular areas or spots, whereas in yellow edge it is continuous round the leaf margin. *Capitophorus fragaefolii*, the vector of yellow edge [*R.A.M.*, xv, p. 732], is a vector of crinkle in America [ibid., xiii, p. 110], as well as of xanthosis, the American analogue of yellow edge [ibid., vii, p. 650], and experiments are planned to determine whether crinkle is also transmitted in England by this insect.

HARRIS (R. V.). **Studies in Strawberry virus diseases. III. Transmission experiments with 'crinkle', 1935.**—*Rep. E. Malling Res. Sta., 1936*, pp. 212–221, 3 pl., 1 diag., 1937.

When strawberry seedling varieties (crosses between English, and English and American commercial varieties) obtained from Cambridge were grown at East Malling in 1934 symptoms appeared closely resembling those of North American crinkle and the analogous disease observed at Long Ashton [see preceding abstracts], though no plants at East Malling had been previously observed to be similarly affected. Fifteen out of 49 families showed yellow edge [loc. cit.] and seven showed distortion or crinkling with small circular to irregular lesions with or without necrotic centres. In five of the families so affected the chlorotic leaf margins and leaf curl characteristic of yellow edge were also very faintly present, while in the remaining two families crinkle alone was observed. An attempt was then made to transmit this form of crinkle by runner grafting from selected plants of the affected seedlings to 'normal' Royal Sovereign plants, a further experiment being made in collaboration with the Long Ashton Station, in which batches of normal Royal Sovereign plants of clonal origin were infected at each centre simultaneously. Both experiments gave positive results, symptoms of severe crinkle developing on the normal indicator plants that closely resembled North American crinkle and the severe type reported from Long Ashton. In addition to the crinkle the indicator plants subsequently developed symptoms of yellow edge. These results appear to confirm the virus origin of crinkle symptoms in England. Furthermore, the following data indicate that crinkle is causally distinct from yellow edge; namely, (1) crinkle symptoms were not transmitted to the exactly comparable yellow edge-infected Royal Sovereign plants used in the initial experiment of 1932 [*R.A.M.*, xii, p. 519]; (2) they did not appear at East Malling in previous years on yellow-edge or normal Royal Sovereign plants, or in combination with yellow edge or otherwise on comparable Royal Sovereign plants at Cambridge; and (3) comparable crinkle symptoms did not appear either alone or in combination with induced yellow edge on Royal Sovereign indicators in parallel experiments made the same year with English commercial varieties.

MOORE (M. H.). **Notes on the control of Strawberry mildew (Sphaerotheca humuli).**—*Rep. E. Malling Res. Sta., 1936*, pp. 276–279, 1937.

Satisfactory control of mildew (*Sphaerotheca humuli*) [*R.A.M.*, xiv,

p. 376; xvi, p. 692] on strawberry plants on which the disease was already well established was obtained at East Malling in 1935 by one application of lime-sulphur (1 or 2 per cent.) or dusting with flowers of sulphur. The effect of the spraying was more lasting than that of the dusting. None of the treatments caused any serious injury. In 1936, two treatments with 2 per cent. lime-sulphur and flowers of sulphur gave the same results as in 1935. Dusting should be effected once every week or ten days and spraying once every two or three weeks during the period when there is a danger of infection.

SIMMONDS (J. H.) & MITCHELL (R. S.). **The squirter disease in Bananas with special reference to its control.**—*Qd agric. J.*, xlvii, 6, pp. 542–548, 1937.

Following a concise review of the results of earlier work on the squirter disease of bananas [*Nigrospora sphaerica* or *N. musae*: *R.A.M.*, xv, p. 104] details are given of further investigations of the control of the disease. In trials of various fungicides for the disinfection of fruit before packing shirlan A.G., used at strengths of 1 and 3 per cent., reduced the percentage of severe black end due to *Nigrospora* from 48·6 to 0·3 and from 61·9 to 8·2, respectively, less satisfactory results being obtained for black end due to *Gloeosporium musarum*. In further experiments fruit from the plantation was brought to the packing shed, cut into part hands or singles, immersed in different brands of shirlan just sufficiently long to ensure thorough wetting, then drained and packed. The fruit was ripened as slowly as possible in rooms kept at the lowest temperature available at the time. The results showed complete control of squirter in singles for all strengths of shirlan used. Fruit dipped in 1 and 3 per cent. shirlan A.G. as one-third hands and then broken into singles showed 0·6 and 1·6 per cent. infection, respectively, compared with 21·7 and 30·2 per cent. in the controls. Fruit treated in part hands and packed as such would give approximately as good control as dipping in singles. The use of 1 per cent. shirlan A.G. is recommended as routine practice during the winter and early summer on all plantations where losses from squirter are likely to occur.

CARTER (W.). **Aphis transmittal of Commelina nudiflora Linnaeus mosaic to Pineapple.**—*Ann. ent. Soc. Amer.*, xxx, 1, pp. 155–158, 2 pl., 1937. [Abs. in *Rev. appl. Ent.*, xxv, A, 8, p. 516, 1937.]

Experiments in Hawaii showed that *Commelina nudiflora* mosaic is transmissible to pineapple by *Aphis gossypii*, *Myzus persicae*, and *Macrosiphum solanifolii*, inducing symptoms closely resembling those of yellow spot [*R.A.M.*, xv, p. 673]. Under field conditions the insects are probably unable to penetrate the relatively hard tissues of the pineapple, which may, therefore, usually escape infection notwithstanding a naturally high degree of susceptibility to the virus.

BRANAS (J.) & BERNON (G.). **Recherches sur les poudres cupriques. (Premier mémoire.)** [Investigations on cupric dusts. (First memoir.)]—*Rev. Vitic., Paris*, lxxxvi, 2238, pp. 367–374, 1 graph, 1937.

In studies on the laboratory evaluation of the efficiency of cupric

dusts against vine mildew (*Plasmopara viticola*) the authors point out that the toxicity of the dusts to fungi stands in direct relation to the solubility of the copper compound embodied in them in atmospheric water. From this consideration, they introduce the concepts of initial and reactional 'anticryptogamicity', the first of which is defined as the ratio of the quantity of copper compound dissolved, in the absence of a solubilizing agent, in water at P_H7 to the total initial amount of the compound in the dust tested, and the second as the additional proportion of the compound dissolved as the P_H value of the water is lowered. In their experiments they tested the solubility of copper sulphate, copper oxychloride, copper hydrocarbonate, and copper hydrate in water at P_H values of 7, 5·7, 5·5, 4, and 3·4, and showed that between the values of 4 and 7 the descending solubility curve assumes the form of a straight line, and that reactional anticryptogamicity may be based on the angle formed by this line with the ordinate. The results indicated that the initial anticryptogamicity of the compounds varied from 72 per cent. for copper sulphate, to 2·7 per cent. for copper hydrocarbonate, 0·33 per cent. for copper hydrate, and nil for the oxychloride, the reactional anticryptogamicity varying from 4·6, to 0·23, 0·21, and 0·19 per cent. respectively. The results of further tests showed that the nature of the inert component (carrier) of the dust very considerably affects the solubility of the copper compound, since talc containing 5 per cent. calcium hydrate reduced it from 72 per cent. for copper sulphate to 0, kaolin raised it to 90 per cent., and powdered ox bile to 100 per cent. Dusts showing unsatisfactory initial and reactional anticryptogamicity are inefficient in practice but dusts satisfactory in this respect may have to be rejected on other grounds. The results indicated that fungicidal dusts should not contain copper salts of a low solubility in water with P_H values close to those of meteoric water, and that alkaline carriers should also be avoided, since they reduce the solubility of the copper salts.

NIKITIN (A. A.). **Zeolitic copper compounds as fungicides.**—Thesis, Columbia Univ., 72 pp., 16 graphs, 1937.

The laboratory and commercial preparation of copper zeolite [*R.A.M.*, xv, p. 665; xvi, p. 544], a new colloidal fungicide, from sodium silicate, sodium phosphate, sodium aluminate, and copper sulphate, is described in detail. Toxicity studies on the product, based on the laboratory method of McCallan [ibid., ix, p. 730], showed that the high copper content (25 per cent.) and low content of insoluble sulphate both improve toxicity, whilst the extremely low basic copper sulphate content reduces crop injury. Extensive fields tests against apple scab (*Venturia inaequalis*), fruit spot (*Phoma pomi*), black rot (*Physalospora cydoniae*) [*P. obtusa*], and insects have demonstrated the superior value of the fungicide both when used alone and with insecticides. Copper zeolite does not generally require a spreader, but the addition of copper soap (1 per cent. by weight of the dry fungicide) increased wetting power and adhesiveness.

MOORE (M. H.), MONTGOMERY (H. B. S.), & SHAW (H.). **Field trials in 1936 of the fungicidal and phytocidal properties of certain new**

chemical preparations. A progress report. I. Fungicidal properties. II. Preliminary phytocide tests.—*Rep. E. Malling Res. Sta., 1936*, pp. 259–266, 1 pl., 1937.

In a spraying test carried out at East Malling in 1936 nine-year-old Worcester Pearmain, Edward VII, Allington Pippin, and Newton Wonder apple trees on No. IX rootstock given two pre- and two post-blossom applications of 1 per cent. lime-sulphur, 0·5 per cent. microsul, sulsol, R.D. 4367, bouisol, or Bordeaux mixture (3–9–100) showed, respectively (aggregating the results for all varieties), 1·4, 13·8, 3·2, 3·8, 1·3, and 2·3 per cent. scab (*Venturia inaequalis*), as against 0·1 per cent. for buffer trees given lime-sulphur at 2·5 and 1 per cent. concentrations for the pre- and post-blossom applications, respectively, and 32·5 per cent. for the unsprayed controls. Lime-sulphur used at a concentration of 1 per cent. for the post-blossom applications caused fruit drop. Both of the copper sprays caused leaf burn and russeting, more particularly bouisol, which also caused severe fruit drop. The Worcester Pearmain and Edward VII controls remained, respectively, lightly infected and uninfected.

In phytocide tests of 15 substances intended for use as fungicides all the copper-containing preparations applied to Cox's Orange Pippin caused severe damage at all concentrations down to 0·1 per cent. of copper, and in one instance down to 0·025 per cent.; the following were all safe at concentrations up to 1 per cent., viz., 25 per cent. tetramethylthiuram disulphide dispersion, 20 per cent. ammonia-shirlan, copper-8-hydroxyquinoline (20 per cent. base), and 10 per cent. brilliant green on bentonite.

MOORE (M. H.) & MONTGOMERY (H. B. S.). **A field spraying trial of combined fungicide-insecticide sprays in 1936. A progress report.**—*Rep. E. Malling Res. Sta., 1936*, pp. 267–275, 1 fig., 1937.

In further spraying tests at East Malling with combined fungicide-insecticide sprays [*R.A.M.*, xv, p. 728] the addition of a spreader to lime-sulphur did not affect the control of scab (*Venturia inaequalis*) on Cox's Orange Pippin and Worcester Pearmain apple trees. In an attempt to reduce the concentration of the lime-sulphur used, it was found that for pre- and post-blossom applications the 1 per cent. strength was as effective in reducing scab on mature fruits as at 2·5 per cent. pre-blossom followed by 1 per cent. post-blossom, but on certain other varieties in another trial [see preceding abstract] the stronger pre-blossom spray was more effective than the weaker. General observation of the foliage indicated that the 1 per cent. spray was inferior. Weak Bordeaux mixture (2-10-100) caused severe leaf burn, defoliation, and russeting, but gave efficient scab control on the fruits.

The addition of nicotine to the petal-fall spray controlled sawfly [*Hoplocampa testudinea*] satisfactorily without a spreader.

STEVENS (N. E.) & WOOD (JESSIE I.). **Recent fluctuations in plant diseases in the United States.**—*Bot. Rev.*, iii, 6, pp. 277–306, 10 graphs, 8 maps, 1937.

The writers discuss, in relation to geographical, environmental, and economic factors, some striking recent instances of fluctuations in the

incidence and severity of some well-known plant diseases in the United States [cf. *R.A.M.*, xvi, p. 479]. Most of the papers cited to illustrate the observations have been noticed in this *Review*.

BRAUN (H.). **Pflanzenhygiene. Richtlinien und praktische Massnahmen zur Gesunderhaltung der Pflanzen.** [Plant hygiene. Indications and practical measures for the maintenance of plant health.]—98 pp., Berlin, P. Parey, 1937. RM. 4 (RM. 3 abroad).

The underlying principle of this practical treatise on plant hygiene is the superiority of prevention to cure, and with this end in view the means of maintaining agricultural crops in a sound condition are discussed under the general headings of cultural, antiseptic, and quarantine measures, the first comprising observations on ecological factors, the improvement of adverse environmental conditions by appropriate cultural practices, and the application of the rules of hygiene to such measures as crop rotation, choice of varieties, seed selection, time and depth of sowing, and planting distance.

MANIL (P.). **Quelques données nouvelles sur les virus des plantes.** [New data on plant viruses.]—*Bull. Soc. Bot. Belg.*, lxix, 2, pp. 149–153, 1937.

In this paper the author briefly discusses some recent advances in the study of plant viruses [*R.A.M.*, xvi, p. 628], the points touched upon including the nature of ultraviruses, virus strains, insect transmission, particle size, plant immunity and resistance, virus complexes, purification, and autocatalysis.

BOYLE (L. W.) & MCKINNEY (H. H.). **Trichomes of incidental importance as centers for local virus infections.**—*Science*, N.S., lxxxv, 2210, pp. 458–459, 1937.

In experiments to determine the relative importance of trichomes and other epidermal cells as points of virus entry, inoculations [?with tobacco mosaic] were made by cutting off or mutilating the trichomes with a fine instrument while immersed in a drop of virus extract under a dissecting microscope. Inoculation of 2,290 cut trichomes of *Nicotiana sylvestris* gave 2·2 per cent. positive results, and on *N. sylvestris*, *N. glutinosa*, and *N. rustica* leaves on which all the trichomes had been mutilated, 35, 22, and 12 per cent. positive results, respectively, were obtained. Trichomes are sparse on pepper (*Capsicum frutescens*) leaves, so it was possible to inoculate, by light rubbing, areas of epidermis without bruising the trichomes. Approximately the expected number of local lesions resulted, showing that ordinary epidermal cells are very susceptible.

When about 95 per cent. of the trichomes on *N. sylvestris* half-leaves were destroyed by wiping, and the whole leaves inoculated by wiping after an interval of two to six days, 6·8 per cent. less lesions resulted on the halves wiped twice than on the others; but when the first wiping was done with carborundum and water, thus destroying about 98 per cent. of the trichomes and injuring or killing many ordinary epidermal cells, the corresponding reduction was 31 per cent.: these results indicate that trichomes are not of major importance, while ordinary epi-

dermal cells are of considerable importance. Pepper and *N. sylvestris* leaves have approximately 16 and 346 trichomes per sq. cm., respectively. Wiped inoculations on the former produced 82·4 per cent. lesions not related to trichomes, whereas on the latter 39·87 per cent. had no relation to trichomes, 39·87 per cent. had broken trichomes in their centres, and 20·26 per cent. had trichomes on their margins and had probably originated from ordinary epidermal cells. It is concluded that the larger percentage of trichome infections in *N. sylvestris* is due to the greater number of trichomes, that many ordinary epidermal cells serve as virus entries, and that the importance of trichomes in this respect has been over-estimated.

CHESTER (K. S.). **A simple and rapid method for identifying plant viruses in the field.**—*Phytopathology*, xxvii, 6, pp. 722–727, 1 fig., 1937.

In an endeavour to adapt the exacting technique of precipitin testing [*R.A.M.*, xvi, p. 698] to field work, the writer found the use of crude, untreated, expressed plant juices to be entirely practicable in tests for the presence of six different viruses. The procedure is as follows. A $\frac{1}{4}$ to $\frac{1}{2}$ of a mature tobacco leaf is wadded into a ball and wrapped in cheese-cloth, pressed, and worked with the fingers until well crushed. Enough juice is squeezed out to reach the 2 c.c. level of a 5 c.c. Wassermann tube, which is then filled nearly to the top with serum dilution (1 : 9 or higher), shaken and set in the ground near the test plant. After a brief interval the reaction is observed, a positive response being denoted by the presence of a flaky-green precipitate, best viewed by transmitted light, which rapidly settles to form a dense green deposit, about 1 cm. in depth. The strongest reactions appear after two to five minutes, and in no case was a specific response apparent after one hour. The tubes should be read after 15 to 20 minutes and again after an hour.

The sera are prepared by the methods previously described [ibid., xiv, p. 781]. Each serum is absorbed with two parts of the juice of healthy specimens of the diseased species used in animal inoculations, and then further diluted to a concentration giving an optimum reaction in laboratory titration. Two c.c. of virus-containing juice proved satisfactory for titration with five of the viruses tested, viz., latent potato mosaic, potato veinbanding [ibid., xvi, p. 703], tobacco ring spot, etch [ibid., xvi, p. 568], and potato aucuba mosaic [ibid., xvi, pp. 337, 569, *et passim*], but in the case of tobacco mosaic, five or six drops per tube gave the best results. The reaction is specific for each virus, regardless of the host, and healthy plant juice reacts with none of the sera. Masking of symptoms does not interfere with the reaction, and in the case of virus mixtures each component may be identified by its proper serum.

The technique herein described, though primarily designed for field work, has also been found valuable in the laboratory, and it seems possible, from the results of preliminary trials, that the list of viruses susceptible to serological methods may be considerably extended through the use of crude juices as test antigens. For instance, two etch strains, severe etch and Blakeslee's Z-mosaic of *Datura*, which fail to react as test antigens in the ordinary precipitation techniques, respond positively with etch serum by the more sensitive field method.

GUINIER (P.). **Sur la formation des 'ronds de sorcière' et le fonctionnement physiologique des mycorhizes ectotrophes.** [Note on the formation of 'fairy rings' and the physiological action of ectotrophic mycorrhiza.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 291–298, 1937.

The author states that in all the cases studied by him in France chemical analysis showed that the ammonia content of soil was markedly higher within the dark green areas marking the 'fairy rings', caused by the development of various Basidiomycetes in meadows and lawn turf, than in the soil immediately inside or outside the rings; the same was also true of the soil taken in coniferous forests from immediately beneath the sporophores of *Craterellus clavatus*, *Clitocybe inversa*, and *C. nebularis*, which form ectotrophic mycorrhiza with the roots of the trees. These findings are interpreted to indicate that the beneficial effect of such mycorrhiza on the trees [*R.A.M.*, xv, p. 673] is due to the accumulation by the fungi of ammonia in the soil.

MAGROU (J.). **Sur la culture des champignons de mycorhizes.** [Note on the culturing of mycorrhizal fungi.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 359–370, 9 figs., 1937.

This is an expanded account of the technique by which the author induced the mycorrhizal endophyte of *Arum maculatum* to grow into drops of soil decoction in Van Tieghem cells, a preliminary paper on which has already been noticed [*R.A.M.*, xv, p. 243; cf. also ibid., xvi, p. 267].

KLEČKA (A.) & VUKOLOV (V.). **Srovnávaci studie o mykorrhize lučních halofytů.** [Comparative studies of the mycorrhiza of meadow halophytes.]—*Ann. Acad. tchécosl. Agric.*, xii, 2, pp. 190–195, 2 pl., 1937. [German summary.]

The roots of *Suaeda maritima*, *Salicornia herbacea*, *Plantago maritima* and six other species of plants collected from salt marshes in Czecho-Slovakia showed the presence of mycorrhiza, which in their morphological and anatomical details were identical with the endotrophic mycorrhiza found by the authors in woody plants, e.g., *Sambucus nigra*. In both kinds of hosts the fungal elements of the mycorrhiza form in the host cells much convoluted agglomerations of hyphae which undergo a process of digestion, and also ovate, thick-walled 'spores'. The presence of the mycorrhiza in the roots of the halophytes examined, especially in the younger rootlets, appears to be frequent, and is interesting in that these formations are able to withstand the high osmotic pressure in the host cells.

BLATTNÝ (C.). **Přispěvek k poznáni intraspecifické averse u plísni.** [Contribution to the study of aversion in mould fungi.]—*Ann. Acad. tchécosl. Agric.*, xii, 2, pp. 138–141, 4 figs., 1937. [German summary.]

Typical aversion phenomena [*R.A.M.*, xvi, p. 245] were observed by the author between monospore cultures of different strains of *Penicillium corymbiferum* [ibid., xiii, p. 380] and *P. glaucum*. Monospore cultures of one and the same strain at first exhibited a slight aversion

from one another, which, however, disappeared later. When strips of the substratum, free from mycelium and spores, were transferred from between the averting colonies to fresh agar and were inoculated with one of the strains exhibiting aversion, the latter produced mycelium, but its fructification was delayed by seven days, indicating the presence in the substratum of a substance inhibiting the growth of the organism, the nature of which is not known. A similar retardation in the fructification of the fungi was also exerted by the 'juices' exuded into the substratum before pupation by the caterpillars of the silkworm *Bombyx mori*. Finally, aversion phenomena were noticed between monopycnidial strains of *Phoma betae*. The author believes that aversion is much more common among fungi than is known at present, especially during the initial stages of growth in culture.

VERNER (A. R.) & ALTERGOT (V. F.). **On the phenomenon of mycophagy.**—*C.R. Acad. Sci. U.R.S.S.*, xv, 4, pp. 219–224, 2 figs., 1937.

The authors state that when grown on Waksman's agar medium or on must agar pure cultures of *Fusarium niveum* frequently underwent a strong lytic process (termed by them automycophagy), resulting in a more or less rapid and complete dissolution of the mycelium. The chlamydospores appeared to be comparatively resistant to the process, inasmuch as they were often found intact in what seemed an entirely disorganized fungus mass. Viable macro- and microconidia were only found in slightly decomposed cultures. The lytic principle was isolated by filtration from the deformed fungus mass of a three-month-old lysing culture of *F. niveum*; besides exerting a lytic action on this organism, it also lysed cultures of *F. lini*, and was found to withstand passage through a Seitz filter No. 3 and repeated boiling for 15 to 20 minutes.

ECKSTEIN (O.), BRUNO (A.), & TURRENTINE (J. W.). **Kennzeichen des Kalimangels, signes de manque de potasse, potash deficiency symptoms.**—235 pp., Berlin, S.W. 11, Verlagsgesellsch. für Ackerbau m.b.H., 1937. [Abs. in *Ernähr. Pfl.*, xxxiii, 17, pp. 267–268, 1 col. pl., 1937.]

This is a trilingual (German, French, and English) scientific and practical treatise on potash deficiency symptoms in 56 cultivated plants of all zones. The first part of the work deals in general terms with the external symptoms of potash deficiency on the foliar, root, floral, and fruiting systems, and growth habit, modifications in the internal structure, secondary effects, such as lessened resistance to disease and other adverse factors, reduction in the market value of the products, and pathological disturbances of functional, metabolic, and physiological processes. In the second portion the effects of potash shortage are discussed in relation to certain particularly important crops, namely, maize and other cereals, fruit trees, and vines. The volume is furnished with fine black and white and coloured illustrations.

SANFORD (G. B.). **Studies on Rhizoctonia solani Kühn. II. Effect on yield and disease of planting Potato sets infected with sclerotia.**—*Sci. Agric.*, xvii, 10, pp. 601–611, 1937. [French summary.]

In experiments extending from 1933 to 1935 the effect of planting

potato setts heavily infected with viable sclerotia of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvi, p. 338] was to reduce the yield of large-size tubers from an average of 42·7 kg. per 100 setts for apparently clean tubers, treated with mercuric chloride, to 40 kg., the total yields from healthy and diseased setts being 55·6 and 59·0 kg., respectively, and the yield of small-size tubers 12·9 and 18·7 kg., respectively. Corresponding figures for 1936 per 10 setts were 296·1 and 317·7, 305·9 and 331·8, and 9·4 and 13·7 oz. respectively. Neither yield of large- or small-size tubers nor total yield were dependable criteria regarding the value of tuber treatments for the control of the disease, the first two giving results in about 40 per cent. of the experiments and the latter in 20 per cent. Out of 3,400 plants from heavily infected setts approximately 58 per cent. had no lesions on the stem. Neither deformed tubers nor sclerotia on the tubers at harvest were reliable indications of any beneficial effect of tuber treatment. From other experiments not reported in this paper a very definite increase of yield both in large-size tubers and total crop was obtained by amputating the first stolons, and although percentage stem infection constitutes a fairly reliable index of both soil infestation and control during early growth, it is necessary to determine the effect on the stolons for control to be interpreted in terms of yield. In conclusion it is suggested that the effect of treatment on the sclerotia may be determined in the laboratory and that on the tuber in the greenhouse in preference to ordinary field tests.

Bryan (H.). **The importance of healthy seed in Potato culture.**—*J. nat. Inst. agric. Bot.*, iv, 2, pp. 179–182, 1937.

Approximately 380,000 acres out of a total 500,000 acres of potatoes grown annually in England and Wales are planted with English-grown seed of unknown health, and the loss by the use of such seed must be enormous. In experiments initiated at Ormskirk in 1929 to ascertain if the health of imported stocks could be maintained without recourse to fresh seed, healthy potatoes of the virus-susceptible Arran Consul variety were grown isolated from other potatoes by a distance not less than 60 yds. Suspects were promptly rogued out, but not more than 2 per cent. of the plants were removed in any year. Comparative trials in the sixth year of the Arran Consul potatoes and best Scotch seed revealed no difference in health and vigour between the two stocks. In 1934 enough Scotch seed of the virus-susceptible but otherwise outstanding new early variety Arran Pilot was supplied to individual farmers (in Lancashire) to plant half-acre plots, these being situated at least 60 yds. from any other stocks of unknown health. The produce was planted in 1935, each farmer planting 6 or 7 acres, and the resulting plants were vigorous, with virus infection not exceeding 2 per cent., the yield being 12 tons per acre. The produce of the seed plots in 1935 was sown in 1936 with similar results. It is important to maintain the ground free from volunteer plants arising from potatoes left from a previous crop.

Dufrénoy (J.) & Bouget (J.). **Études sur des maladies à virus de la Pomme de Terre.**—[Studies on certain virus diseases of the Potato.] *Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 181–200, 6 figs., 1 graph, 1937.

Potato viruses in north-western Europe are roughly divisible into

two large groups, namely, those belonging to the virus X group, non-transmissible by the aphid *Myzus persicae*, and those that are transmissible by this insect and include viruses Y and F [*R.A.M.*, xvi, p. 337]. A brief description is appended of the various symptoms caused in the potato by these viruses alone or in combination with one another, and figures are given of cytological modifications effected as a result of infection by viruses X and Y [ibid. xvi, p. 705]. In France, potatoes are almost always infected by at least one virus, frequently by two, and often by three. With reference to the transmission of virus Y, the authors state that at Saint André de Cubzac potatoes carrying X developed 'frisolée' (X+Y) [ibid., xiv, p. 246] as early as June as a result of infection by Y transmitted by *M. persicae* which had overwintered on cabbages. At Truc-Vert, on the Atlantic Coast, potatoes grown from Y-free seed showed 90 to 100 per cent. primary symptoms of infection by Y '(bigarrure)' [ibid., xv, p. 460] in July, the vector *M. persicae* hibernating on a peach tree in the vicinity. The rapid spread of the virulent virus Y is responsible for most of the degeneration of potatoes in France.

The results of experiments carried out by Bouget at the suggestion of Costantin demonstrated the possibility of preserving stocks of Majestic and Up-to-Date potatoes (received free from virus X from Murphy in Ireland) or of virus-free potatoes grown from true seed, from infection by virus Y by cultivating them in fire-breaks in pine forests on the south-west French coast of the Atlantic (Landes), at a distance of some kilometres from vegetable crops or peach trees, or under insect-proof cages the construction of which is briefly described.

CRALLEY (E. M.) & TULLIS (E. C.). **Effect of seed treatments on seedling emergence, severity of seedling blight, and yield of Rice.**—*Bull. Ark. agric. Exp. Sta.* 345, 24 pp., 1 fig., 1937.

In this account of a detailed study carried out in Arkansas from 1933 to 1936, inclusive, on seedling blight of rice the authors state that the condition is a disease complex found in most rice-producing countries and that the amount of blight that develops in a crop depends on weather conditions and the microflora of the rice seed and soil. Isolations from 2,074 diseased seedlings gave most consistently species of *Fusarium* (of which the two most frequently isolated closely resembled *Gibberella moniliformis* and *G. fujikuroi*), a *Rhizoctonia* closely resembling *R.* [*Corticium*] *solani*, *Curvularia lunata* [*R.A.M.*, xvi, p. 490] and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: loc. cit.] all of which produced blighting of Supreme Blue Rose rice seedlings grown *in vitro* under aseptic conditions and have been reported as pathogenic on rice seedlings by other workers.

Under greenhouse conditions the disease occurred at soil temperatures ranging from 18° to 34° C. The heaviest pre-emergence blight usually developed at the lower temperatures, at which *O. miyabeanus* was most active; *F.* spp. were most active at the higher ones. Experimental seed treatments with formaldehyde, ethyl mercury phosphate, ethyl mercury chloride, and red copper oxide dust gave inconsistent results [which are tabulated] and are not at present recommended.

ZAPROMETOFF (N. G.). Пирикуляриоз Риса [Piriculariosis of Rice.] —*Социалистическая Наука и Техника* [*Socialistic Science and Technique*], Tashkent, *1937*, 2, pp. 76–78, 1937.

The author records the occurrence of rice blast (*Piricularia oryzae*) in the Russian Central Asia (Uzbekistan), and gives a summarized review of the work done in the investigation of this disease and of its control.

HOEDT (T. G. E.). **Bestrijding van meeldauw.** [Mildew control.]—*Bergcultures*, xi, 21, pp. 761–762, 1937.

Sulphur dusting for rubber mildew [*Oidium heveae*: *R.A.M.*, xvi, p. 202] control in west Java [ibid., xiv, pp. 152, 743; xv, p. 145; xvi, p. 160] should be commenced immediately the first transparent spots become perceptible on the newly formed leaves after wintering and continued at one- to two-weekly intervals until the process of refoliation is complete in 80 to 90 per cent. of the trees in the plantation. The sulphur should be applied by means of a motor apparatus at the rate of 3 to 5 kg. per hect. In production (as opposed to seed) plantations it is neither necessary nor desirable to eliminate mildew entirely, not only on account of the prohibitive cost of the operations but also because the over-luxuriant flowering resulting therefrom is liable to weaken the trees and induce an excessively humid atmosphere in which bark pathogens thrive.

DE FLUITER (H. J.). **Mouldy rot, geconstateerd in het ressort van het Besoekisch Proefstation.** [Mouldy rot observed in the district served by the Besoeki Experiment Station.]—*Bergcultures*, xi, 26, pp. 945–946, 1937.

Mouldy rot of *Hevea* rubber (*Ceratostomella fimbriata*) [*R.A.M.*, xv, p. 345] is reported to have been observed for the first time during the early part of 1937 in the district of Java served by the Besoeki Agricultural Experiment Station. The tapping of diseased trees should be discontinued and daily applications of 10 to 20 per cent. agrisol, 7·5 to 15 per cent. brunolinum and carbolineum plantarium, 5 to 10 per cent. kill-germ, 3 to 5 per cent. izal [ibid., xv, p. 734; xvi, p. 634], or 3 to 5 per cent. paragerm made to the bark until a cure is effected, after which a preventive treatment should be given every four days. A mixture of asphalt (60 per cent.), solar oil (40 per cent.), and carbolineum (10 per cent.) may also be used as a protective coating. Izal (3 to 5 per cent.) should be used to disinfect the tapping knives, which have been shown to constitute the chief means of spread of the fungus in Malacca. The duration of the tapping period should be restricted to a week alternating with a week's rest.

SOESMAN (J. G.). **Maatregelen en tapcontrôle ter bestrijding van Phytophthora.** [Precautions and tapping restriction for *Phytophthora* control.]—*Bergcultures*, xi, 24, pp. 865–869, 1 diag., 1 graph, 1937.

Details are given of the writer's experiments, conducted in the Besoeki district of Java from 1933 to 1937, inclusive, showing the beneficial effects on stripe canker (*Phytophthora*) [*palmivora*] of rubber [*Hevea brasiliensis*: *R.A.M.*, xvi, p. 634] of curtailment of the tapping

period, antiseptic treatment of the tapped surfaces, and maintenance of the trees and soil covering in a healthy condition.

Schade (A. L.) **Observations on a Monascus isolated from Rubber.**—*Mycologia*, xxix, 3, pp. 295–302, 1937.

A specimen of smoked crude rubber of *Hevea brasiliensis* received at the Harvard Botanical Museum in 1931 was attacked by mites and various fungi, including *Monascus ruber* [*R.A.M.*, ix, p. 736]. Inoculation tests showed that *M. ruber* and *M. purpureus* grew well on crude rubber free from mites, the former developing rather better than the latter on pale crepe, smoked sheet, and latex-sprayed rubber. The smoked condition hindered but little the growth of the fungi.

Chand (H.). **Study of the fungus flora of the Lahore soils.**—*Proc. Indian Acad. Sci.*, Sect. B, v, 6, pp. 324–331, 1937.

As a result of platings from soils taken from plots at the Government College Botanic Garden, Lahore [*R.A.M.*, xvi, p. 710] the author isolated 19 species of fungi, including *Rhizopus nodosus, Mucor botryoides, Cunninghamella echinulata, Sordaria macrospora, Chaetomium globosum, Trichoderma lignorum* [ibid., xv, p. 824], *T. glaucum, Spondylocadium fumosum, Heterosporium allii, Helminthosporium anomalum, Alternaria malvae,* and *Stemmaria terrestris.* A complete list of fungi so far recorded from Indian soils is appended. Species of *Aspergillus* and *Penicillium* are the most numerous in soil, and either the former or the latter predominate depending upon whether the temperature is high or low.

Hampp (H.). **Prüfung der Hopfenperonospora-Bekämpfungsmittel auf dem Hopfenversuchsgut Hüll 1936.** [Trial of Hop *Peronospora* control preparations in the Hüll Hop experimental garden in 1936.] —*Prakt. Bl. Pflanzenb.*, xv, 1–2, pp. 20–24, 1937.

Details are given of laboratory and field experiments in the control of hop downy mildew (*Peronospora*) [*Pseudoperonospora humuli*] in Bavaria [*R.A.M.*, xvi, p. 61] in 1936, from which it appears that all the fungicides officially authorized for this purpose, viz., Wacker's Kupferkalk [copper oxychloride: ibid., xv, p. 583; xvi, p. 230], brand 934 of the same, cuprenox, and Kupferkalk Spiess, gave very satisfactory results, both as regards toxicity to the fungus and adhesion to the plants in the presence of rain, the latter feature being particularly marked in the case of 934. All were applied at the rate of 1 per cent. except cuprenox, which was used at a strength of 0·5 per cent. for the main treatments and at 1 per cent. only for two of the final ones; the latter concentration, however, caused scorching of the styles and unsightly blemishes on the cones. Of the other preparations tested only 0·5 per cent. Kupferkalk 'V' reached the requisite standard of efficacy for inclusion in further more extensive trials.

D'Emmerez de Charmoy (D.). **La lutte contre la mosaïque de la Canne à sucre à la Réunion.** [The control of Sugar-Cane mosaic in Réunion.]—*Rev. agric. Réunion*, N.S., xlii, pp. 1–10, 1937.

This paper is a reprint of one already noticed from another source [*R.A.M.*, xv, p. 258].

McMartin (A.). **Pathological conditions affecting growth of Sugar Cane plant cuttings from Natal.**—*S. Afr. Sug. J.*, xxi, 5, pp. 267, 269, 271; 6, pp. 353, 355, 357, 359, 5 figs., 1937.

Buds produced from the base of sugar-cane setts emerge less rapidly than those at the top and do not so readily adjust themselves to their new environment. During this 'lag' phase they are subject to infection by a number of weak fungal parasites occurring either in the soil or in the internal tissues of apparently sound canes, viz., *Cephalosporium sacchari* [*R.A.M.*, xvi, p. 341], *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., xvi, p. 206], *Melanconium* [*Pleocyta*] *sacchari*, *Himantia stellifera* [ibid., xv, p. 607], *Aspergillus* sp., *Penicillium* sp. (all on the setts), and *Rhizoctonia* sp. and *Pythium* sp. on the roots. The setts may decay before the shoots emerge or the latter may reach a height of a few inches before succumbing, while under favourable conditions for cane growth externally healthy plants may be produced, which, however, harbour the organisms in their tissues as mentioned above. Infection from internal sources appears to be most prevalent under very humid planting conditions, while dry weather promotes external contamination.

Field observations suggest that Co. 290 is more susceptible to *Cephalosporium sacchari* than Co. 281, which is prone to attack by *Ceratostomella paradoxa*. Root rots mostly affect Co. 290 and Co. 301, while *Pleocyta sacchari* is prevalent on P.O.J. 2725. For control it is recommended that only setts with white, well-formed buds should be planted, and plant cane should be exclusively used. Thin sticks and excessively short-jointed material should be rejected, as also should canes showing pathological symptoms of any kind. The physical condition of the soil at planting time should be as fine as possible and the setts should not be too deeply covered. Preliminary experiments indicate that the rots may be combated to some extent by organic mercurial treatment of the setts before planting, while beneficial effects may also be expected to follow partial soil sterilization.

Abbott (E. V.), Rands (R. D.), & Summers (E. M.). **Disease resistance and new seedling selection in 1936 at the U.S. Sugar Plant Field Station, Houma, La.**—*Sug. Bull.*, xv, 14, pp. 3–7, 1937.

Full details are given of the progress made during 1936 in sugar-cane breeding work at the Houma Sugar Plant Field Station, Louisiana [*R.A.M.*, xv, p. 605]. *Inter alia* it is stated that progeny studies conducted over three years on 8,900 seedlings from 43 crosses have resulted in at least 10 crosses which are very promising as superior disease resistant varieties.

Baldacci (E.). **La conception d'espèce chez les Actinomycètes par rapport à leur classification et à leur determination.** [The species concept in the Actinomycetes in relation to their classification and determination.]—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 5, pp. 138–147, 1937.

After referring to the confusion at present existing in the specific determination of the Actinomycetes, the author discusses in some detail the criteria on which he considers such determinations should be based.

Morphological characters are of absolute value in specific determinations, especially as regards their variations; biometrical characters are less important, but should be noted. Biochemical reactions are a useful guide only if studied together, and according to a standard technique. Chromogenesis has specific value only when associated with constant morphological and cultural characters. The significance of pathogenicity is as yet uncertain, as pathogenic activity in some genera may be inconstant. Species should not be made to depend mainly on biological characters, and physiological and nutritional characters and habitat have no specific value whatever. Pleomorphism in cultures needs to be taken into account as it may be a source of error. All the above-mentioned characters should be used as a basis for a complete systematic revision of the Actinomycetes.

NEILL (J. C.). **The mould fungi of New Zealand. I. The genus Penicillium.**—*Trans. roy. Soc. N. Z.*, lxvii, 1, pp. 101–112, 3 pl., 1937.

The author lists 19 species of *Penicillium* encountered in work on mould fungi in New Zealand, with short descriptions of the species, their cultural characters on Czapek's agar, and an indication of the habitat.

SHEAR (C. L.). **Mycological notes. I.**—*Mycologia*, xxix, 3, pp. 355–363, 1937.

In this the first of a series of notes on genera and species of fungi, the author discusses five subjects, of which the following may be mentioned. *Discella effusa* B. & C., as represented by a specimen in Michener's Herbarium on apple and believed to be part of the type collection has spores typical of the bitter rot of apple (*Glomerella cingulata*). From the examination of type specimens of the type species of *Naumovia* (*N. abundans*) [*R.A.M.*, vii, p. 808], *Rosenscheldia* and *Gibberidea*, the author concludes that these genera are synonymous, *Gibberidea* having priority; *G. obducens* Rick. on living stems of *Mentha* is regarded as identical with *R. paraguaya* which is renamed *G. paraguaya*. *Sphaeropsis uvarum* Berk. & Curt. 1874 is the same as *Coniothyrium diplodiella* (Speg.) Sacc. [syn. *Phoma diplodiella* Speg. 1878: *R.A.M.*, xvi, p. 152] on grapes. It is apparently rare in the United States.

KARLING (J. S.). **Pascher and the genus Asterocystis of De Wildeman.**—*Mycologia*, xxix, 3, pp. 291–294, 1937.

The genus *Olpidiaster* was proposed by Pascher in 1917 as a new name for *Asterocystis* (1893) on the ground that the latter name had already been used for a genus of the red algae by Gobi in 1879 [*R.A.M.*, viii, p. 282]. Gobi's genus, however, was spelt *Asterocytis* and there is, therefore, no good reason for replacing *Asterocystis* by *Olpidiaster*. De Wildeman differentiated *Asterocystis* from *Olpidium* on the grounds that the resting spores are stellate, with a thin membrane, a large refractive globule, and are not plasmolysed by glycerine, but these distinctions are no longer tenable. So far as knowledge goes at the present time there appears to be no good evidence for the separation of *Asterocystis* from *Olpidium*. The number of species of *Olpidium* described in the past few

years will require critical study before their validity can be determined conclusively.

Bataille (F.). **Monographie des Exoascacées d'Europe.** [A monograph of European Exoascaceae.]—*Ann. Soc. Linn. Lyon*, N.S. (*1935*), pp. 121–134, 1936.

A brief account is given of the distinguishing features of the Exoascaceae, supplemented by an outline of the history of the family, which the writer, following Saccardo, divides into *Exoascus* and *Taphrina* [*R.A.M.*, iv, p. 447; vi, p. 260], and by keys to the genera and species and a list of synonyms.

Săvulescu (T.) & Săvulescu (Olga). **Beitrag zur Kenntnis der Uredineen Rumäniens.** [A contribution to the knowledge of the Uredineae of Rumania.]—*Ann. mycol. Berl.*, xxxv, 2, pp. 113–118, 5 figs., 1937.

An annotated list is given of 21 species of rusts not hitherto reported from Rumania, two of which and one variety are new to science and are furnished with Latin diagnoses. *Puccinia dobrogensis* n.sp. forms on living leaves of *Iris pumila* in the Dobrudja (Dobrogea) diffuse, dark olive, discrete or confluent lesions, the centres of which are occupied by black teleutosori producing yellowish-brown teleutospores of variable shape, 33 to 54 by 15 to 21 (average 49·5 to 54 by 16·5) μ, with a fragile pedicel, 33 to 44 μ in length, intermingled with numerous oblong or ellipsoid mesospores, 30 by 15 μ, and provided with brown, linear to clavate paraphyses. *P. antirrhini* was introduced into the country in 1936 on *Antirrhinum majus* leaves and stems [see above, p. 752]. *Uromyces ambiguus* was observed on *Allium scorodoprasum* [ibid., xi, p. 619] leaves and stems in the Dobrudja, *Melampsora repentis* and *M. salicis albae* on *Salix repens* and *S. alba* leaves, respectively, both in Bessarabia, and *Melampsoridium carpini* on *Carpinus betulus* in Muntenia.

Cummins (C. B.). **Studies in the Uredinales of the Philippines.**—*Ann. mycol., Berl.*, xxxv, 2, pp. 98–105, 8 figs., 1937.

An annotated list is given of 22 species of rusts (13 new, with Latin diagnoses) recently collected by Mrs. Clemens in the Philippines, including *Puccinia arayatensis* n.sp. and *Uraecium derridicola* n.sp. on *Derris* sp.

Johnston (J. R.). **Los hongos 'royas' en Guatemala.** [The 'rust' fungi in Guatemala.]—*Rev. agric., Guatemala*, xiv, 9, pp. 473–478, 1937.

Among the rusts mentioned in this semi-popular note as affecting Guatemalan crops are *Puccinia rubigo-vera* [*P. triticina*: *R.A.M.*, xii, p. 499] on wheat, *Uromyces phaseolorum* [*U. appendiculatus*] on runner beans [*Phaseolus vulgaris*: ibid., xvi, p. 660], *U. striatus* on lucerne [see above, p. 754], *Tranzschelia punctata* [*Puccinia pruni-spinosae*: see above, p. 755] on peach and wild cherry (*Prunus capuli*), and *Phragmidium disciflorum* [*P. mucronatum*] on rose.

LIRO (J. I.). **Über neue, seltene und vermeinte Ustilagineen.** [On new, rare, and presumptive Ustilagineae.]—*Ann. bot. Vanamo*, vi (*1935–1936*), 1, pp. 1–18, 1935. [Finnish summary. Received 1937.]

This is a critically annoted list of 11 new, 4 rare, and 3 presumptive Ustilagineae. *Tuburcinia colchici* [*R.A.M.*, xiv, pp. 12, 494] is recorded on *Narcissus triandrus* from Spain, this being apparently a new host for the smut.

MALENÇON (G.) & YEN (W. Y.). **Une nouvelle espèce de Sorosporium.** [A new species of *Sorosporium.*]—*Rev. Mycologie*, (N.S.) ii, 3–4, pp. 130–131, 2 figs., 1937.

A brief description [with a Latin diagnosis] is given of a smut, considered to be new to science, which the authors found in Morocco attacking the whole inflorescence of *Panicum repens*, and which they name *Sorosporium punctatum.* It is characterized by creamy-brownish, cylindrical or curved sori formed by the transformation of the whole inflorescence, 60 to 70 by 4 to 5 mm.; the spores are agglomerated into balls of several hundreds, measuring 43 to 72 μ or 54 to 102 by 42 to 70 μ [40 to 100 by 40 to 60 μ in the diagnosis]; they are spherical or subspherical, olive-brown, 4·8 to 7·5 μ in diameter or 5 to 6 by 7 to 9 μ [5 to 7 μ in the diagnosis], and superficially punctuated with sparse and clearly distinguishable warts. Microscopically the fungus approaches *S. africanum*, and macroscopically it resembles *S. syntherismae.*

LOJKIN (MARY). **A study of ascorbic acid as an inactivating agent to Tobacco mosaic virus.**—*Contr. Boyce Thompson Inst.*, viii, 6, pp. 445–465, 4 graphs, 1937.

This is an amplified account of studies referred to in part in a preliminary notice by the author already abstracted [*R.A.M.*, xvi, p. 282]. In these further studies the course of oxidation of ascorbic acid and inactivation of tobacco mosaic virus under varying conditions was followed by simultaneous measurements of the amount of ascorbic acid oxidized and the relative infectivity of the virus in the virus-ascorbic acid system. It was found that the rate of oxidation of the ascorbic acid and the rate of inactivation of the virus were highest in media approximately neutral in reaction and diminished with an increase or decrease in acidity. The virus remained unaffected in contact with the reduced form of ascorbic acid, or with dehydroascorbic acid provided the acids were not undergoing autoxidation, but if the ascorbic acid underwent autoxidation induced by catalytic cupric ions the virus lost its infectivity. Autoxidation of ascorbic acid without inactivation of the virus, however, can be induced in the absence of copper by alkaline media of P_H 8·6 or by the enzyme hexoxidase, and these results suggest that the inactivation of the virus is due to some intermediate product of the autoxidation of ascorbic acid by the cupric ions. Such inactivation does not occur when the autoxidation proceeds in the presence of catalase and this indicates that the intermediate product is a peroxide. Cupric peroxide failed to explain the inactivation reaction and the active substance is thought to be probably an organic peroxide.

Gratia (A.). **Mise au point, pour les usages biologiques, de l'ultracentrifugeur à air comprimé de Henriot et Huguenard.** [The adaptation for biological purposes of Henriot and Huguenard's compressed air ultracentrifuge.]—*C.R. Soc. Biol., Paris*, cxxv, 17, pp. 371–375, 2 figs., 1937.

Some recommendations of a highly technical order are made for adjustments to Henriot and Huguenard's compressed air ultracentrifuge facilitating its use for biological purposes, such as the study of bacteriophages. In this connexion mention is made of the fact that when the juice of mosaic-diseased tobacco is centrifuged for about ten minutes at 75,000 revolutions per minute, the specific mosaic antigen remains in suspension in a limpid, colourless liquid, entirely free from sediment, reacting by pronounced flocculation to the addition of anti-mosaic serum [cf. *R.A.M.*, xvi, p. 713].

Best (R. J.). **The quantitative estimation of relative concentrations of the viruses of ordinary and yellow Tobacco mosaics and of Tomato spotted wilt by the primary lesion method.**—*Aust. J. exp. Biol. med. Sci.*, xv, 2, pp. 65–79, 6 figs., 1937.

The results of dilution experiments with the viruses of ordinary and yellow tobacco mosaic [*R.A.M.*, xvi, p. 638] and tomato spotted wilt [ibid., xvi, p. 571] at the Waite Agricultural Research Institute, University of Adelaide, are tabulated and discussed.

For the two first-named viruses, tested on *Nicotiana glutinosa*, the dilution curve falls into three parts: (*a*) a flat portion at high virus concentrations where a large change in concentration results in a much smaller change in the number of lesions produced; (*b*) a straight line section covering a useful concentration range (1/1,000 to 1/10,000) in which a change in concentration involves an equivalent change in the number of lesions; and (*c*) a section at high dilutions where changes in lesion numbers are again proportionately smaller than concentration. In the case of ordinary mosaic it was immaterial whether pure virus or clarified infective juice was used for the preparation of the inoculum.

The general shape of the curve for tomato spotted wilt (tested on Blue Pryor tobacco plants) resembles the foregoing except at the lower concentrations, where changes in lesion numbers are proportionately greater than those in virus concentration. This divergence, however, has been shown to depend on the season at which the counts are made, as well as on the environmental conditions prevailing after inoculation.

The degree of aggregation of ordinary tobacco mosaic virus in concentrated solutions has been shown to change with dilution. For instance, if a portion of a suspension containing the white, satiny fibres of the virus [ibid., xvi, p. 639] is diluted to only five times its original volume, the fibres are no longer visible, having apparently been broken down to submicroscopic dimensions. As the dilutions increase, the possibility of a reaggregation of dissociated particles will become progressively slighter. Another variable factor to be taken into consideration in curve formation is the degree of susceptibility of the host to the particular virus concerned. There are, indeed, such a number of factors implicated in the relationship between virus concentration and lesion numbers that a single equation can scarcely be expected to represent

the connexion over the whole dilution range. For practical purposes, however, that section of the curves over which direct proportionality between virus concentration and lesion numbers operates affords a reasonably accurate working range for the estimation of relative concentrations.

GOLDIN (M. I.). **On the so-called masking of virus diseases.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xv, 9, pp. 567–569, 1937.

The results of experiments in 1936 in the Crimea, in which *Nicotiana glutinosa* plants were inoculated with the juice obtained from aseptically collected apical leaves of apparently healthy tobacco plants taken from field plots with 36, 28, 28, and 18 per cent., respectively, of the plants visibly infected with mosaic, showed that 87, 60, 43, and 20 per cent., respectively, of the apparently healthy plants carried the mosaic virus in a masked condition, the real infection percentage in those plots being thus raised to 91, 65, 59, and 35, respectively. This indicates that determination of percentage infection with mosaic in tobacco plantations, and probably also in the case of other virus diseases by external symptoms alone is not reliable.

SILBERSCHMIDT (K.). **A doença 'vira-cabeça' do Fumo.** [The 'vira-cabeça' disease of Tobacco.]—*Biologico*, iii, 6, pp. 183–184, 1937.

A brief description is given of a virus disease, first noticed some years ago, which is stated to cause very considerable damage to tobacco plantations in the State of São Paulo, Brazil. The most striking outward symptom of the trouble, responsible for its vernacular name 'vira-cabeça' [twisted head] is a bending down of the growing point of the stems, due to the unilateral development of elongated necrotic lesions on the stems [cf. 'corcovo' in the Argentine: *R.A.M.*, xi, p. 269]. In the initial stages of infection, the young leaves lose their natural brightness, become markedly rugose, and their margins curl downwards; later, there is a clearing of the veins, the younger leaves are chlorotic and the older yellow, and angular necrotic markings develop along the veins of the third order; in still further advanced cases, these necrotic lines may also run along the main veins, leaving wide interveinal bands of green tissue, especially on the older basal leaves, from which they extend to the stem. Many of the diseased plants also show a reduction of their root system, with a rot of the finer roots. So far tobacco varieties resistant to the disease have not been found, but considerable variations in the incidence and severity of the trouble have been observed in different districts. The disease is transmissible by grafting, and, according to observations in Campinas by Dr. Santos Costa, by the insects *Thrips tabaci* and *Frankliniella* sp. It is most destructive to tobacco seedlings, many of which are usually killed soon after transplanting in the field. The control measures recommended are a strict roguing of all diseased plants both in the seed-bed and in the field, as well as the suppression of the insect vectors.

THUNG (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag Oogstjaar 1935–1936. *Meded. Proefst. vorstenl. Tab.*, 84, pp. 25–42, 1937.

The writer's insistence in his previous year's report [*R.A.M.*, xv,

p. 686] on the need for a widespread campaign against mosaic in the Vorstenland (Java) tobacco plantations [ibid., xvi, p. 413] bore fruit in the extensive adoption of such precautionary measures as dipping the workers' hands in 4 per cent. formalin for planting operations, the roguing-out of diseased seedlings by means of specially constructed ploughs, and chemical control of the insect vectors of the disease. These measures resulted in an appreciable reduction of infection in most plantations, but many problems, both theoretical and practical, remain to be solved in connexion with the epidemic developments of mosaic.

Slime disease [*Bacterium solanacearum*: loc. cit.] appears to be steadily gaining ground, and there are indications that the causal organism, like *Phytophthora* [*parasitica nicotianae*: loc. cit.], is mud-borne. In connexion with the control of the latter fungus attention is drawn to the necessity of complete fermentation of the tobacco refuse used for manuring. The disinfection of irrigation channels by means of 1·5 per cent. ammonia, passed through the flowing water for 4½ hours, was experimentally shown to be feasible but the expense and other difficulties of the method are likely to prove prohibitive in practice. Terbolan (2 per cent.) [ibid., xiv, p. 533] and 1·5 per cent. copper sulphate are also effective for superficial soil sterilization. When water cultures of Canary and Timor tobacco seedlings were inoculated with mycelium of *P. parasitica nicotianae*, the roots of the former were permeated in two days by the mycelium and bore profuse sporangia, while in the latter the fungus made practically no growth. The Canary roots soon died, whereas those of the Timor plants remained in a sound condition and made further growth.

Some delay in the development of mildew [*Erysiphe cichoracearum*: ibid., xv, p. 686] and reduction in its incidence again followed the application of sulphur to the soil, but complete control was not achieved. A correlation has been established between the abundant foliar growth consequent on wide planting and increased mildew infection. Groundnuts grown in frames with infected tobacco plants showed mildew spots within ten days and during the second month *Crotalaria juncea* plants in the frame also contracted infection. Some divergences in the size of the conidia may point to morphological or to biological differences in the strains under observation, but the question remains to be decided by inoculation experiments.

Bacillus [*Erwinia*] *aroideae* [ibid., xv, p. 346] is probably responsible for the majority of cases of stem rot, which assumed a severe form in November, 1936. The specific 'top rot' symptoms of the disease were only once observed locally in 1935; as a rule the tops remain normal and the rotting is confined to the pith of those portions of the stem from which the leaves have already been harvested.

Leaf spot [*Cercospora nicotianae*: ibid., xvi, p. 414] was virtually absent in 1935, but more serious attacks occurred during the second half of November, 1936, as a sequel to heavy precipitation.

McMurtrey (J. E.). **Distinctive effects on the growth of the Tobacco plant when certain mineral nutrients are deficient.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 478–479, 1937.

In this note on the symptoms of mineral deficiencies on tobacco

[*R.A.M.*, x, p. 346] the author states that nitrogen deficiency causes the whole plant to become light green and the lower leaves to turn light brown later on. Phosphorus deficiency [ibid., xv, p. 263] produces dark green plants, with dark brown leaves if 'firing' takes place. Shortage of potassium or magnesium produces localized effects, chlorosis of the lower leaves being the most salient symptom. Lack of iron or manganese produces chlorosis; in each case the veins remain green, but manganese deficiency causes a necrotic spotting scattered over the leaf, while iron deficiency does not generally produce spotting. Sulphur deficiency also causes chlorosis, in which the veins are paler than the tissue between them. Calcium shortage first shows itself as a hooking downward of the tip of the young leaves of the terminal bud followed by the death of the young leaves at the tips and margins. Boron deficiency [loc. cit.] produces a light green colour at the base of the young leaves of the bud, followed by their breakdown, which in turn, if not too severe, is succeeded by later growth with twisted or distorted leaves.

Chamberlain (E. E.) & Brien (R. M.). **Tomato seedling damping-off.** —*N.Z.J. Agric.*, liv, 6, pp. 321–327, 3 figs., 1937.

Results are given of experiments on the control of damping-off (*Pythium ultimum*) of tomato seedlings [*R.A.M.*, xv, p. 690] by the use of disinfectant dusts, the treated seed being sown in untreated or steam-sterilized soil inoculated with the fungus. None of the seven dusts tested gave complete control, but several were sufficiently effective to warrant their use by growers who have not facilities for treating their soil, and of these ceresan U.T. 1875, agrosan G, and high-grade copper carbonate are recommended. Monohydrated copper sulphate and red copper oxide gave very promising results each in one test, and copper oxychloride in one test proved slightly less efficient than the ceresan. Damping-off was more difficult to control in soil which had been steam-sterilized before being inoculated with the fungus.

Müllers (L.). **Bakterielle Tomatenwelke.** [Bacterial Tomato wilt.]—*Obst- u. Gemüseb.*, lxxxiii, 6, pp. 85–86, 1 fig., 1937.

Popular notes are given on the symptoms of tomato bacterial wilt (*Aplanobacter michiganense*) [*R.A.M.*, xvi, p. 642] and stem rot (*Didymella lycopersici*) [ibid., xiii, p. 403], both of which are stated to have caused heavy damage to large-scale greenhouse and field plantings in Germany in 1936. For the control of the former the writer recommends seed treatment with ceresan and dipping the roots of the seedlings in a loam emulsion with the admixture of 0·25 per cent. uspulun. The pathogen is largely spread from plant to plant by the common practice of cutting off the young shoots or removing them with the finger-nail; it is preferable to break them off and so avoid contact with the wounds. Diseased plants and the soil surrounding them should be burnt and infested sites not replanted with tomatoes during the next season.

Cook (W. S.). **Relation of nutrition of Tomato to disposition to infectivity and virulence of Fusarium lycopersici.**—*Bot. Gaz.*, xcviii, 4, pp. 647–669, 7 figs., 1937.

A tabulated account is given of experiments conducted to determine

the relation of nutritional factors to the reaction of tomatoes to infection by *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xvi, p. 419]. The susceptible Bonnie Best and the resistant Marglobe were used, and nutrition was varied by applying or withholding nitrates under otherwise identical conditions. The inoculum was applied either directly to the roots of plants growing in sterilized white quartz sand (post-inoculated) or to the sand before planting (pre-inoculated). Recovery of the fungus from the stem base was used as a criterion of infection and macroscopic symptoms as a criterion of virulence.

Infection was prevalent both in resistant and susceptible plants under minus nitrate nutrition, but external manifestations were commonly absent in this series, while no wilting of Marglobe took place either in the plus or minus nitrate lots, though seedlings of this variety were readily infected in both series. Type of inoculation and age of plant were important factors in infection, pre-inoculation of the sand leading to a higher frequency of infection and symptom production, besides practically halving the incubation period (25 as against 44 days for post-inoculation). Post-inoculated plants under minus nitrate culture developed no symptoms, even if infected. In the plus nitrate series Bonnie Best, either pre- or post-inoculated, showed a high frequency of infection and symptom production of both the chronic and acute types at all times of year.

Browning of the vascular bundles of the stem is not in itself an adequate criterion of infection, having been absent in 35·4 and 18·3 per cent. of the infected plants in the minus and plus nitrate series, respectively.

VERRALL (A. F.) & MAY (C.). **A new species of Dothiorella causing die-back of Elm.**—*Mycologia*, xxix, 3, pp. 321–326, 6 figs., 1937.

The pycnidial stage of the *Cephalosporium* responsible for die-back of elm [see next abstract] in North America has been isolated from elm collected in Virginia, Connecticut, Ohio, New Jersey, and Oklahoma, and developed in culture on sterilized elm twigs. Single spore isolations from pycnidia on naturally diseased elm produced the typical *Cephalosporium* stage on agar, and trees inoculated with single-spore isolates developed typical symptoms of the disease and yielded both stages of the fungus. The pycnidia develop sparsely on newly formed cankers on twigs and small branches and are often associated with other fungi. The fungus is named *Dothiorella ulmi* n.sp., with a diagnosis in English and Latin. The basal stroma is irregularly circular to elongate, 100 to 385 μ across, and early erumpent; the pycnidia are partially embedded in the stroma in groups of 2 to 12, occasionally single, subcoriaceous when mature, glabrous, globose to irregular, 63 to 161 μ in diameter, with non-papillate ostioles and unicellular, hyaline, elongate, straight or slightly curved conidia, rounded at both ends and measuring 2·9 to 5·4 by 0·5 to 1·0 μ (average 3·6 by 0·8 μ); conidiophores are absent and the conidia histogenic.

The fungus was isolated from 42 per cent. of 57,547 specimens of elm suspected of Dutch elm disease [*Ceratostomella ulmi*] originating from 28 States and Canada.

Creager (D. B.). **The Cephalosporium disease of Elms.**—*Contr. Arnold Arbor.*, x, 91 pp., 16 pl., 2 figs., 1 graph, 1937.

This is a comprehensive, tabulated account of the writer's studies on the *Cephalosporium* disease of elms, an abridged version of which has already been noticed from another source [*R.A.M.*, xvi, p. 645]. The disease appears to be restricted to the United States and Canada, where it chiefly attacks *Ulmus americana*, though *U. fulva* and *U. pumila* may also be infected and in the laboratory *U. japonica* proved susceptible. The detection of primary leaf lesions and of large-scale pycnidial production, new features of the disease, is reported here in addition to the more generally recognized symptoms.

Two types of fructification are formed by the fungus—one bringing it into relation with the Hyphomycetes and the other with the Sphaerioidaceae; both have now been shown to be essentially 'endoconidia'. The taxonomic position of the organism is obscure; on some media it presents typical *Cephalosporium* characters, on others those of *Cadophora* develop, while on others again an affinity with the Sphaerioidaceae is indicated. *Cephalosporium* fructifications are formed in profusion on a synthetic nutrient agar medium without sugar. Pycnidia are formed abundantly on over-wintered twigs killed by the organism and the disease is largely spread by pycnospores with the aid of wind, rain, and insects. The pycnidial stage has recently been named *Dothiorella ulmi* [see preceding abstract] and while this position is as good as any other for the organism at present the author considers more information is desirable for a satisfactory determination. The mycelium spreads from the vascular system of the leaf veins into that of the stem and subsequently invades the wood parenchyma, rays, pith, cambium, phloem, and cortical parenchyma.

Spierenburg (Dina). **Bestrijding van het 'vuur' in Eschdoorns.** [Control of 'fire' in Maples.]—*Tijdschr. PlZiekt.*, xliii, 6, pp. 150–151, 1937.

Maples (*Acer* spp.) in general and sycamores (*A. pseudoplatanus*) in particular are liable in Holland to infection by *Nectria cinnabarina* [*R.A.M.*, xvi, pp. 286, 299], control of which may be effected as follows. The trees should be given a preliminary application of Bordeaux mixture (7·5–5–50) to prevent the germination of any spores that may be present on the branches. Lesions should be treated with fruit tree carbolineum (50 per cent. in summer, 100 per cent. in winter) and the diseased areas then excised down to the healthy tissue, the debris being collected in sacks placed round the stems and burnt. The wounds are then treated with 10 per cent. carbolineum and (after drying) covered with coal tar, whereupon another application of Bordeaux mixture should be given. The same preparation should be applied in the following spring and autumn to all affected trees.

Bottomley (A[veril] M.). **Some of the more important diseases affecting timber plantations in the Transvaal.**—*S. Afr. J. Sci.*, xxxiii, pp. 373–376, 1937.

The only timber trees grown to any extent in the Transvaal are black

wattle (*Acacia mollissima*), eucalypts, and pines, and of these the first-named is as yet apparently free from any important specific disease. Eucalypts are not subject to any widely distributed disease though two are potential sources of danger, namely stem rot and root rot caused by *Stereum hirsutum* and *Armillaria mellea*, respectively. The former is a common saprophyte throughout the country and was responsible for a soft dry rot of the centre of the stem of *Eucalyptus globulus* near Roodepoort in 1919; the latter caused a dying off of *E. paniculata* near Tzaneen in 1932. *A. mellea* [*R.A.M.*, xiii, p. 425] and *Helicobasidium compactum* [ibid., xiv, p. 426] are, however, serious diseases of standing pine and have occasioned the death of thousands of pine trees in the Zoutpansberg mountains during the last four or five years. The Transvaal form of *A. mellea* differs from the typical form in the absence of rhizomorphs, spread being effected by means of root contact. The disease causes a yellowing of needles followed by wilting and death. It appears to follow the planting of exotics on land previously carrying native timbers and in the area in question stumps and roots of *Parinarium mbola* are probably the chief source of infection. In the Cape typical rhizomorphs are commonly found on fruit trees attacked by the fungus. Trees infected by *H. compactum* show a stunting of the terminal shoots, yellowing of the needles, followed by wilting and death, a marked constriction at the collar, with sometimes a purplish-brown growth of the fungus. Infection is probably spread by spores or by mycelium in the soil and not by root contact.

Summary of legislation affecting agricultural industries as at 31st December, 1936.—*Rep. agric. Dep. St Kitts-Nevis*, pp. 46–49, 1937.

Schedules are given of plant disease legislation in force in St. Kitts and Nevis, West Indies, on 31st December, 1936.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xi, 6, p. 120, 1937.

French West Africa (Ivory Coast). A Decree of the Governor-General of French West Africa, dated 9th January, 1937, approves a Decree of 17th November, 1936, of the Lieutenant-Governor of the Ivory Coast, enforcing the declaration of groundnut rosette [*R.A.M.*, xvi, p. 653].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. List of intercepted plant pests, 1936.—83 pp., 1937.

Lists are given of pests and diseases intercepted on plants or plant products entering the United States during the period 1st July, 1935, to 30th June, 1936. Among the interceptions recorded are *Physalospora obtusa* on apple from Australia [*R.A.M.*, xi, p. 114], *Sclerotium oryzae* [*Leptosphaeria salvinii*] on rice from Australia and South Africa, *Phoma destructiva* on *Capsicum annuum* from Brazil and Mexico, *Gloeosporium limetticolum* on lime from Brazil, Costa Rica, Cuba, Guatemala, Honduras, and Panama, and *Macrosporium* [*Alternaria*] *tomato* on tomato from Italy [ibid., xiii, p. 809].

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ZAPROMETOFF (N. G.) & MIKHAILOFF (E. N.). Болезни Шелковицы. [Mulberry diseases.]—*Тр. Ср.-Азиат. Научно-Исслед. Инст. Шелков.* [*Trans. Cent.-Asian sci. Res. Inst. Sericult.*], *Tashkent*, *1937*, 14, 50 pp., 16 figs., 2 graphs, 1937. [English summary.]

According to Zaprometoff, the results of investigations in 1935 in the neighbourhood of Tashkent, Russian Central Asia, showed that mulberry blight (*Bacterium mori*) [*R.A.M.*, xvi, p. 73] attacks all mulberries of a shrub-like habit of growth, while semi-standard and standard trees are usually immune; among the former the most susceptible was the Japanese species *Morus kagayamae*, while the Japanese *M. bombicis*, *M. multicaulis*, and *M. alba* came next, and the local variety Khasak of *M. alba* suffered the least. The severity of the disease was considerably increased by absence of direct sunlight and defective cultivation of the soil. Summer pruning of infected shoots, together with disinfection of the cut ends with formalin (1 in 100) proved to be an effective means of control against blight of the Japanese mulberries. Investigations have shown that the disease is widespread in Uzbekistan, and is also present in other mulberry-growing regions of the U.S.S.R., namely, Khirghizia, Tadjikistan, Bashkir Republic, Ukraine, North Caucasus, and Transcaucasia.

Mikhailoff gives an account of isolation and cultural studies which showed that the morphological, cultural, serological, and pathogenic properties of *Bact. mori* are strikingly constant, irrespective of the source of origin, nature of substratum, or age (up to three years) of the isolates studied. In nature it is frequently accompanied by a Gram-negative rod, non-pathogenic to the mulberry. Experiments showed that neither organism is pathogenic to the silkworm.

An account is further supplied by Zaprometoff of his studies on the leaf spot of the mulberry, caused by *Cylindrosporium maculans* (All.) Jacz. (syn.: *Septogloeum mori* Br. & Cav., and *Phleospora maculans* All.), which chiefly attacks the local (Khasak) shrub-like mulberry, while hybrids between the local and the Japanese varieties are apparently immune. Infection and intensity of the disease are favoured by crowded conditions in the plantations and lack of proper cultivation, and pruning retards the development of the trouble.

The pamphlet terminates with a list, compiled by Zaprometoff, of

23 mulberry diseases recorded up to 1935 in the neighbourhood of Tashkent and in the Fergana valley, including *C. moricola* Jacz. (syn. *P. moricola* [(Pass.)] Sacc. [*Mycosphaerella mori*: ibid., xv, p. 67]), *Uncinula mori*, *Phyllactinia corylea* [ibid., xvi, p. 491], *Botrytis cinerea*, and ten non-parasitic diseases.

HEIM (R.) & BOURIQUET (L.). **Les maladies des Albizzia à Madagascar.** [*Albizzia* diseases in Madagascar.]—*Rev. Bot. appl.*, xvii, 190, pp. 405–412, 3 figs., 1937.

In this brief account of the diseases of *Albizzia stipulata* and *A. lebbek*, the two main shade trees of coffee in Madagascar, the authors state that in the Farahony valley in that island the former species was found in 1934 to suffer from a condition, the main symptom of which is the development at the base of the trunk of an abnormal cracking in the bark, usually extending up to 50 cm. above the collar, and either girdling the whole stem or occurring on one side of it; this condition is sometimes associated with a die-back of the crown, which may occur, however, without any cracking of the bark at the collar. Although the trouble was not seen before 1934, it is rapidly gaining ground; in 1935 up to 70 per cent. of *A. stipulata* trees were found to be attacked by it in certain localities. Diseased trees frequently showed the presence under the cracked bark of white or greyish mycelial fans, consisting of sinuous, rarely septate hyphae, 1·6 to 3·5 μ in diameter, surrounding nodules of a soft or liquid gum, and sometimes continuous with the mycelium of dead sporophores of a species of *Coprinus*, probably *C. radians* [*R.A.M.*, viii, p. 3], which is believed to be involved, possibly together with some other fungus, in the causation of the disease. An attempt to control the condition by the application of a 2·5 per cent. formol solution to the base of diseased or suspected trees, together with the removal of all infected material in the plantations, is stated to have given excellent results.

In the Ivoloina and Onibe valleys, to the north of Tamatave, *A. stipulata* is subject to a cankerous gummosis, usually fatal, which attacks trees of all ages. It starts from the base and works upwards, in the form of small cracks in the bark which increase in time and finally break up the cortex into small parallelipipeds; these drop off and leave the wood bare, so that dead trees appear as barkless skeletons. While the cause of this disease is not yet known, it is not believed to be physiological, the activity of a wound parasite appearing to be more probable.

In the Sambirano region, *A. lebbek* has been observed for a few years to be attacked by a serious cracking of the bark at the base of the trunks, associated with the exudation of gum, and a withering and shedding of the crown leaves; it is believed to be probably due to a *Nectria* species of the *ditissima* group, abundant fructifications of which were found on a dying tree.

WATERMAN (ALMA M.). **New hosts and distribution of Rehmiellopsis bohemica.**—*Phytopathology*, xxvii, 6, pp. 734–736, 1937.

Since the detection of *Rehmiellopsis bohemica* on *Abies concolor* in Massachusetts, Maine, and New York in 1933 [*R.A.M.*, xii, p. 408], the

fungus has been observed causing needle and twig blight on the same host and *A. cephalonica* in Rhode Island, on *A. lasiocarpa* in British Columbia, and on *A. balsamea* in Maine. Of seven other *A.* spp. exposed to natural infection by *R. bohemica* in eastern Massachusetts, only *A. nobilis* and *A. fraseri* contracted the disease, the former having previously been reported by Rostrup as a host of the fungus in Denmark (*Dansk bot. Ark.*, ii, 5, 1916), while the latter appears to constitute a new record.

LAUGHTON (ELAINE M.). **The incidence of fungal disease on timber trees in South Africa.**—*S. Afr. J. Sci.*, xxxiii, pp. 377–382, 1937.

Of the fungi recorded on *Pinus radiata* in South Africa, *Sphaeropsis pinicola* Speg. (syn. *Diplodia pinea* [*R.A.M.*, xvi, p. 219] and *D. megalospora*) is the most important, hail wounds affording entrance to the fungus, which, once established, is a vigorous parasite, girdling the stem, and causing the death of the trees. The pathogen has been found by Miss Lurie to enter the uninjured bud of the plant, but it does not penetrate the axis to any serious extent. Continued infection and dying back of the laterals increase the damage, but the tree usually sends out a new leader and recovers. Losses from the disease have restricted the tree almost entirely to the Western Cape Province, but in the Midlands and Eastern Cape Province there are well-drained soils where the trees have flourished in spite of infection and eventually completely recovered. Experiments by Miss Hancock, using seedlings of *P. radiata* grown with controlled supplies of water, showed that growth is impaired when soil moisture is considerably reduced, or increased to a high water content, the range being much more restricted than that tolerated by *P. patula*. Inoculations on the latter resulted in very little damage, whereas the former host was readily infected and when grown under unfavourably wet or dry soil conditions the attack was severe. The fungus causes blueing of timber of *P. radiata* even in the Western Cape Province, and is indeed the main cause of blueing throughout the country. *Ceratostomella pilifera* [ibid., xvi, p. 578] has been found on logs in the Eastern Transvaal, but the fruit bodies contained no spores.

During the past four years a dying-off of *P. pinaster* has occurred in Cape Peninsula, the trees wilting and turning brown, especially at the apex, within a week, death usually taking place in a fortnight. *Rhizoctonia lamellifera* [ibid., xvi, p. 683] was found to have invaded the main root, but the final dying-off is attributed to drought effects on the superficial feeding roots. A similar infection was observed in older trees of *P. muricata*, *P. echinata*, and one specimen of *P. radiata*.

An undetermined species of *Rhizoctonia* is recorded as affecting *P. pinaster* in the Eastern Transvaal, and a species of *Corticium* was found causing some mortality on seedlings of indigenous trees in the Knysna district, where whole groups of *P. radiata* and *P. pinaster* were killed off by a similar infection.

A species of *Diplodia* indistinguishable from *D. natalensis* [ibid., xvi, p. 219] occurred on *Acacia mollissima* in the Eastern Transvaal as well as Natal, affecting the whole root system and extending up the side of the stem to form heavy, black cankers. The fungus was readily isolated and formed fruit bodies in culture.

Baxter (D. V.). **Some resupinate Polypores from the region of the Great Lakes, VIII.**—*Pap. Mich. Acad. Sci.*, xxii, pp. 275–296, 7 pl., 1937.

In this contribution [*R.A.M.*, xvi, p. 6] descriptions are given of six resupinate Polypores from North America and in addition the growth characteristics of 19 brown Polypores in culture are tabulated and discussed. The problem of distinguishing resupinate Polypores in culture is complicated by the fact that many distinctive forms appear in the 35-week-old litre flask cultures but are not apparent in cultures made in tubes on Petri dishes for periods up to four weeks. In spite of the variations produced, cultural characters can be used as supplementary to the morphological features of the fruit body itself in identifying these fungi. Of the species tested, *Trametes isabellina* is said to cause a sap and heart wood rot of fallen trees, particularly the lodgepole pine [*Pinus contorta* var. *latifolia*], in western North America.

Richardson (N. A.). **Wood preservatives.**—*For. Prod. Res. Rec., Lond.*, 17 (Wood Pres. Ser. 3), iii + 13 pp., 1937.

In this concise account of the wood preservatives used in England, the author classes the products as (A) oil type preservatives, comprising coal tar creosote (British specifications for which are given) [*R.A.M.*, xvi, p. 581], coal tar, water gas tar creosote, wood tar creosote, petroleum oils, and waste sump oil; (B) water-soluble type preservatives, viz., zinc chloride, sodium fluoride, magnesium silicofluoride, copper sulphate, mercuric chloride, and certain arsenic compounds, and (C) solvent type preservatives in which the toxic chemical is dissolved in a volatile solvent. Notes are given on the various preservatives, and concluding sections deal with patented and proprietary products and the choice of preservatives.

Brown (Mrs. M.). **Mine timber preservation.—Mine fungi.**—*S. Afr. J. Sci.*, xxxiii, pp. 383–389, 1937.

As a result of tests of various timber preservatives in mines [cf. *R.A.M.*, xv, p. 186] on the Rand it was found that timber impregnated with zinc sulphate plus sodium fluoride with dinitrophenol as a solvent showed within a fortnight of being installed an improved condition compared with untreated timber, and after 3½ years was in a very satisfactory condition, whereas untreated poles decayed within a year. In one series of tests, all the treated timbers were covered with lime, which had been borne by air currents from a lime mixer, and were completely destroyed within a year, indicating that factors other than fungal organisms influenced the destruction of the timber [ibid., xv, p. 622]. In localities with prevailing temperatures about 90° F. or over deterioration is slow, and untreated timbers only showed signs of decay after 2½ years.

Of the fungi involved, an apparently new species of *Merulius* severely attacked mine timbers not exposed to particularly damp conditions. *Polyporus rugulosus* occurs on timber in very wet situations and is common in some of the Central Rand mines and also in some of those on the East Rand. *Poria vaporaria* is found in some mines in localities

where the temperature ranges from about 68° to 72°, and *Coniophora cerebella* [*C. puteana*: ibid., xvi, p. 581] occurs at the same temperatures. *Paxillus panuoides* [ibid., xvi, p. 3] and *Polystictus versicolor* [ibid., xvi, p. 580] grow in some mines in Eastern Transvaal, and *Lentinus lepideus* has been collected in one of the Central Rand mines. A number of plantation fungi (including *Lenzites repanda, Stereum hirsutum, Polyporus gilvus, P. fruticum, Polystictus occidentalis, Ganoderma applanatum, G. lucidum, Trametes albotexta*, and a species of *S.* near *S. spadiceum* [ibid., xiii, p. 810]) also occur. Fungi normally regarded as destroyers of coniferous timber grow readily on hardwoods underground. In the mines, different fungi are to be observed on timber at different levels according to the temperature, *Schizophyllum commune, Lenzites trabea*, and the undescribed species of *Merulius* all being high temperature forms; *S. commune* is of no economic importance as it does not weaken the timber.

ECKBO (N. B.). **Forest products investigations.**—*S. Afr. J. Sci.*, xxxiii, pp. 362–372, 1937.

In timber preservation investigations at the Forest Products Institute, Pretoria West, since 1921 it was found that hardness of wood is no criterion of durability. Sapwood is readily decayed regardless of the species of wood, and only comparatively few and unimportant species have durable heartwood. *Acacia pallens, Faurea macnaughtonii, Pygeum africanum*, and five other indigenous species withstood decay for six years and are classed as durable, together with seven exotic species of *Eucalyptus*. Grade I creosote (American specification) [*R.A.M.*, xvi, p. 430] is most effective against decay, while zinc chloride (5 per cent.) is used for structures not in contact with the ground, and zinc chloride (3 per cent.)+arsenious oxide (1 per cent.) has given good results for superstructures of buildings where the arsenical salt is not objectionable. Creosote (80 per cent.) and crude oil (20 per cent.) is slightly cheaper than creosote and so far equally efficacious. In tests in progress at the Consolidated Main Reef Mines [see preceding abstract], timber treated with creosote, creosote and fuel oil (40 : 60), zinc chloride, arsenite of soda and fuel oil (1 : 100), and some other mixtures remained fairly sound to sound after nine years service.

DECOUX (L.), VANDERWAEREN (J.), & ROLAND (G.). **Recherches effectuées en 1936 sur la pourriture du cœur de la Betterave sucrière.** [Researches carried out in 1936 on Sugar Beet heart rot.]—*Publ. Inst. belge Amélior. Better.*, v, 3, pp. 187–192, 1937. [Flemish, German, and English summaries.]

In these further studies [*R.A.M.*, xvi, p. 149] Hilleshög sugar beets grown in pots containing sand, peat, and chemical fertilizer (*a*) with no added dressing, (*b*) with 1 gm. borax added, (*c*) 1 kg. calcium fertilizer (in the form of sugar factory scum containing 48 per cent. quicklime) which reduced the hydrogen-ion concentration from P_H 7·2 to 8·3, and (*d*) the borax and lime mixed, had, respectively, a sugar content of 18·1, 19·8, 18·1, and 20·3 per cent., and a sugar yield of 31, 35, 38, and 56 gm. per root.

In a field test with the same variety planted as early as 31st March,

1936, the highest yield (9,227 kg. per hect.) was obtained in the plots dressed with ammonium nitrate (125 kg. N. per hect.) and borax (20 kg. per hect.); applications of ammonium nitrate alone reduced the yield of sugar. The incidence of heart rot in this field in 1936 was negligible, whereas in 1935 the crop was severely affected, the difference being due probably to climatic conditions (154 mm. of rain in July in 1936, and 8 mm. in 1935).

JAMALAINEN (E. A.). **Juurikkaiden sydän- ja kuivamädän torjunta booripitoisilla aineilla.** [On the control of heart and dry rot in Beets with substances containing boron.]—*Maatalous*, xxix, 3, 4 pp., 1 fig., 1936. [Received September, 1937.]

The efficacy of boron in controlling heart and dry rot of sugar beet in Finland was demonstrated in an experiment in which the application of boric acid at the rate of 5 kg. per hect. reduced the percentage of diseased plants from 49·1 to 7·6 and increased the yield from 11·4 to 20·8 metric tons per hect.

HIRSCH (H.). **Enkele opmerkingen over het hartrot van de Suikerbiet.** [Some observations on the heart rot of the Sugar Beet.]—*Tijdschr. PlZiekt.*, xliii, 5, pp. 115–120, 1 pl., 1937.

The writer's inoculation experiments with *Phoma betae* [*R.A.M.*, xvi, p. 510], *Fusarium merismoides* [ibid., xv, p. 765], and *Cladosporium herbarum* on healthy sugar beets and those deprived of boron indicated that the former sustain no appreciable damage under normal conditions of cultivation, whereas in the latter the development of heart rot consequent on the absence of boron [see preceding abstracts] is accelerated by fungal infection. It may be concluded, therefore, that boron deficiency is the primary cause of heart rot, the symptoms of which cannot be induced by fungi unless the normal growth of the plants has ceased as a result of the lack of this essential element.

GORDIENKO (F. I.). Бактеріальний характер коренеїда Цукрових Буряків і боротьба з ним в умовах **1934** р. [Bacterial nature of the root disease of Sugar Beet and its control under the conditions that prevailed in 1934.]—ex *Збірник наукових праць по Захисту Рослин* [*Collection of scientific papers on Plant Protection*], pp. 63–68, Держ. Видавн. Колгос. і Радгос. Літер. УССР [Ukr. Publ. Off. Collect. & Co-op. Fmg Lit.], Kieff, 1936. [Received May, 1937.]

The author states that the warm and dry weather throughout the spring of 1934 in the Ukraine did not prevent a widespread and severe outbreak in May of that year of the root disease of sugar beet seedlings usually attributed to the activity of various fungi [*R.A.M.*, xiv, p. 281] under cool and moist conditions; in certain localities the disease destroyed up to 90 per cent. of the crop. Isolations from the diseased beet seedlings almost invariably failed to reveal the presence of such fungi as *Phoma betae*, *Aphanomyces levis*, and *Pythium de Baryanum*, but consistently yielded a number of bacteria, among which *Bacillus mycoides* [ibid., xvi, p. 676] was constantly represented. This organism, together with certain other bacterial strains, was experimentally shown

to be pathogenic to the beet seedlings, the greatest percentage of infection (50 to 60) being obtained with a mixture of four strains, including *B. mycoides*. Field investigations showed that the disease was most prevalent and severe on poorly cultivated soil, with a compact crust under the three or four superficial centimetres of loose soil. It is considered that adequate and deeper cultivation should be effective in preventing such outbreaks.

Kotchura (O. I.). Возбудители дырчатой пятнистости листьев Сахарной Свеклы. [Causal agents of the shot-hole leaf spot of the Sugar Beet.]—*Научн. Зап. по Сахарн. Промышл.* [*Sci. Notes Sug. Ind.*,] *Kieff*, [Grey Ser.], xiii, 5–6, pp. 170–175, 3 figs., 1937.

An account is given of a disease of sugar beets, first described in 1924 by Mouravieff under the name 'shot-hole leaf spot' from the Ukraine, and since found to be widespread in that country, where it is especially harmful to young seedlings, many of which are killed by infection of the hypocotyl. On the leaves the grey or brown, slightly translucent, irregular spots of varying size, surrounded by a darker and furrowed margin, develop during the whole vegetative period; the diseased tissues in time dry up and fall out; the spots were also observed on the stems, sepals, inflorescences, and seeds of affected plants. Isolations from diseased tissues yielded 12 strains of bacteria, two of which, namely, a species considered to be new to science and named *Bacillus butyricus betae*, and *B. mesentericus vulgatus* [*R.A.M.*, xiv, p. 356], were experimentally shown to be pathogenic to beet seedlings. *B. butyricus betae* is a rod, 2 to 6 by 1·2 μ, with rounded ends, occurring singly or in pairs; it is peritrichous, Gram-positive, facultatively aerobic, forming oval spores but not capsules. It liquefies gelatine, forms acid and gas from dextrine, levulose, glucose, saccharose, lactose, maltose, and mannite, peptonizes milk, reduces nitrates, but not litmus, does not produce hydrogen sulphide or indol, and hydrolyses starch. The bacillus was frequently isolated from the blackened central vascular bundle of beet seedlings collected in the field, and was shown to be able to cause root rot of beets. Of a number of soil-inhabiting bacteria which were tested, *B. mycoides* [see preceding abstract] was also shown to be able to cause a leaf spot very similar to the one described above on young beet seedlings. All the organisms entered the host tissues without wounding, presumably through the stomata. Cultural methods during vegetation are recommended against the disease, infection by which in the later stages of growth is usually followed by complete recovery of the affected plants.

Murphy (D. M.) & Pierce (W. H.). **Common mosaic of the garden Pea, Pisum sativum.**—*Phytopathology*, xxvii, 6, pp. 710–721, 2 figs., 1937.

The symptoms induced by common pea mosaic (pea virus 3) [*R.A.M.*, xv, p. 418; xvi, p. 722] on garden peas in Idaho range from severe yellow mottling and dwarfing (Alderman, World's Record, and Market Surprise varieties) to less intense mottling and general chlorosis (Alaska and Telephone). In the greenhouse blue lupins (*Lupinus angustifolius*), chick peas (*Cicer arietinum*), and grass peas (*Lathyrus sativus*)

inoculated with pea virus 3 developed apical necrosis (spreading throughout the plants in the two first-named) and severe foliar mottling, while common vetch (*Vicia sativa*) leaves were mottled and curled. Pronounced mottling and chlorosis were typical symptoms of infection on broad beans (*V. faba*) and sweet peas (*L. odoratus*), alsike clover (*Trifolium hybridum*) showed vein-clearing and faint mottling, while a definite yellow mottling characterized crimson (*T. incarnatum*) and red clover (*T. pratense*) [cf. ibid., xvi, p. 294]. Other plants shown by inoculation tests to be susceptible to pea virus 3 included *Desmodium canadense*, *Lupinus albus* and other species, *Medicago arabica*, *Melilotus alba* and its var. *annua*, *M. indica*, *M. officinalis*, *Phaseolus acutifolius* var. *latifolius*, and various species of *Trifolium*. Forty-four varieties of garden and 17 of field peas were shown by inoculation tests to be susceptible to pea virus 3, resistance to which, on the other hand, was manifested by American Wonder, Canners' Gem, Dwarf White Sugar, Early Bird, Horal, Hundredfold, Laxton's Superb, Little Marvel, Morse Market, Notts Excelsior, Onward, Perfection, Premium Gem, Rice's 13, Surprise, Thomas Laxton, White Marrowfat, Wisconsin Early Sweet, Zwaan's Banquet, Mackay, and Tom Thumb.

None of the 4,263 seedlings raised from seed collected from severely infected Alderman and Dwarf Alderman plants contracted mosaic, the transmission of which through the seed is concluded to be very exceptional. Pea aphids (*Illinoia* [*Macrosiphum*] *pisi*) fed on diseased peas and then transferred to 25 healthy Asgrow 40 plants communicated pea virus 3 symptoms to 16 of the latter within three weeks. The virus was found to be inactivated in Alderman peas by exposure to a temperature of 60° C., and no infection was obtained with inoculum aged for three days at 22°.

PURVIS (E. R.) & RUPRECHT (R. W.). **Cracked stem of Celery caused by a boron deficiency in the soil.**—*Bull. Fla agric. Exp. Sta.* 307, 16 pp., 3 figs., 1937.

In recent years cracked stem of celery [*R.A.M.*, iv, p. 393] has become more prevalent throughout the celery-growing areas of the eastern United States and Canada, often causing 50 per cent. loss of crop. The disease manifests itself by a brownish mottling of the leaf, first affecting the margins of the bud leaves. The stems are brittle and show brown stripes in the epidermis above the vascular bundles of the stalk. Transverse lesions appear above the vascular bundles and the broken tissues curl backwards and turn dark brown. The roots become brown, the laterals dying back and forming small knob-like appendages at their extremities.

In water culture experiments plants receiving no boron developed cracked stem, but recovery of diseased plants was effected by the addition of 1·08 p.p.m. boron. In field tests the application of commercial borax close to the base of the plants at the rate of 10 lb. per acre, two weeks after setting in the field, prevented the disease. Good results have been obtained by applying the borax in solution, using spraying machines with the disks of the nozzles removed. The borax will probably have to be applied annually in light soils and every second or third year in others. In cultural studies 0·54 p.p.m. of boron sufficed for

normal growth, and while twenty times this amount was not injurious, toxicity was evident at 16·2 p.p.m. Applications of 20 lb. per acre produced definite injury in a number of plants.

MUNDKUR (B. B.). **Anthracnose of Cucurbits in the Punjab.**—*Curr. Sci.*, v, 12, pp. 647–648, 1 fig., 1937.

In April, 1937, severe damage was caused on kakri (*Cucumis melo* var. *utilissima*) and kaddu (*Lagenaria vulgaris*) near Ferozepore in the Punjab by a disease very closely resembling cucurbit anthracnose, attributed in the United States to *Colletotrichum lagenarium* [*R.A.M.*, xvi, p. 655] but not hitherto recorded in India. The disease is reported to have been observed in previous years, but usually appeared much later. The spores of the fungus measured 12 to 27 by 4 to 6 μ with a mean of 16·5 by 5·1 μ, and are therefore slightly longer than those of the American fungus.

DE BRUYN (HELENA L. G.). **Heterothallism in Peronospora parasitica.**—*Genetica*, xix, 6, pp. 553–558, 2 figs., 1937.

This is an expanded account of the writer's studies on heterothallism in *Peronospora parasitica*, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 415]. By the regular transference of the fungus to fresh sterile cabbage seedlings it has been found possible to keep pure monospore cultures growing for some years.

TOMPKINS (C. M.) & TUCKER (C. M.). **Phytophthora rot of Honeydew Melon.**—*J. agric. Res.*, liv, 12, pp. 933–944, 4 figs., 1937.

A brief account is given of a fruit rot which, in 1935, destroyed practically all the honeydew melons (*Cucumis melo* var. *inodorus*) grown in a diseased area, two acres in extent, on heavy, waterlogged soil, in the neighbourhood of Modesto, California. The symptoms of the disease, which affected both immature and ripe fruits, consisted of small brown or water-soaked lesions, enlarging to form large, occasionally zonate lesions, beneath which the invaded fruit tissues became soft, water-soaked, and odourless. Isolations yielded *Phytophthora capsici* [*R.A.M.*, xiv, p. 222], this being the first definite record of this fungus on a cucurbit, although this species may also have been involved in Drechsler's isolation of a *Phytophthora* with prominently papillate sporangia from a honeydew melon [ibid., viii, p. 383], and in Merrill's report of *P. citrophthora* on watermelon, squash, and pumpkins in California [ibid., viii, p. 550]. In addition to the Honeydew melon, the fungus was experimentally shown to be pathogenic to 14 species of fruits in 11 genera belonging to six families, and including avocado pear, peach, apple, and tomato. It is believed that the disease may be controlled by good soil drainage and careful irrigation practice.

P. drechsleri [ibid., xv, p. 550] was experimentally proved to be able to attack the Honeydew melon.

DEMOLON (A.), BURGEVIN (H.), & MARCEL (M.). **Culture du Champignon de couche sur fumier artificiel.** [Cultivation of the edible Mushroom on artificial manure.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 141–153, 1 fig., 1 graph, 1937.

This is an amplified account of the authors' experiments on the

cultivation of the edible mushroom [*Psalliota* spp.] on artificial manure, a preliminary report of which has already been noticed [*R.A.M.*, xiv, p. 555; xvi, p. 585]. It is stated that while the use of artificially prepared manure is still rather restricted among mushroom-growers, owing to shortage of properly trained labour, a second, 'dilution' method, involving the mixture of one part of horse stable manure with five of moistened wheat or oat straw and the addition of an appropriate quantity of mineral nitrogen salts prior to the fermentation of the whole mass, is apparently rapidly gaining ground.

GEISS (W.). **Die Champignonkultur.** [Mushroom-growing.]—74 pp., 30 figs., Eugen Ulmer, Stuttgart, 1937. [Abs. in *Gartenbauwiss.*, xii, 3, p. 47, 1937.] RM. 2.

This manual treats in popular terms of the cultivation of mushrooms [*Psalliota* spp.] in Germany, and includes discussions on the biology of the mushroom, the preparation and maintenance of the beds, the principal diseases and pests of the crop and their control, and other technical matters.

ZWEIGELT (F.). **Verfallserscheinungen am Rebstock.** [Degeneration symptoms in the Vinestock.]—*Z. PflKrankh.*, xlvii, 1, pp. 11–18, 1937.

In this note the author gives a cursory survey of the work which is being done at present on the pith disease of the vine [*R.A.M.*, xvi, p. 587] in Austria, Yugoslavia, Czecho-Slovakia, and elsewhere, and states that his own investigations and those of his assistant Voboril, all point to the exceptional importance of the pith in the physiology of the vine. This may be explained by Mohorčič's recent discovery (*Weinland, 1936*, 6) that this pith is strikingly rich in potassium throughout the vegetative period, whereas in other plants, e.g., the elder [*Sambucus nigra*], it is devoid of potassium as early as August. As the vine shoot develops, the pith gradually becomes woody, and it is thought that in the vine the pith serves for the storage of potassium which is used by the plant for wood formation. Any disturbance in the pith due to parasites or other agents leads to serious consequences for the whole vine stock. In the author's opinion the greatest obstacle to a clear understanding of the pathology of the pith disease is the present defective knowledge of the anatomy and physiology of the vine.

RAVAZ (L.). **L'Oïdium.** [*Oidium.*]—*Progr. agric. vitic.*, cvii, 19, pp. 438–439, 1 fig., 1937.

The author states that spring renewal of infection of the vine with *Oidium* [*Uncinula necator: R.A.M.*, xvi, p. 17] may usually be traced back to the presence in the vineyards of old infected stocks, belonging to a highly susceptible variety, such as Carignan, Terret, or Muscat, on which the parasite overwinters inside the buds and resumes growth at temperatures below those necessary for the opening of the vine buds, 10° or 11° C. Failing removal from the vineyards, such stocks should be kept under careful observation and abundantly sprayed before the start of vegetation with a potassium permanganate solution, to which a wetter may be added immediately before application. This first

treatment should be supplemented later with copious applications of sulphur dust.

ALDEBERT (P.). **Les maladies physiologiques et parasitaires de la Vigne en 1936.** [Physiological and parasitic Vine diseases in 1936.]—*Bull. Soc. Agric. Algérie*, lxxix, 496, pp. 189–191, 1936. [Received April, 1937.]

'Coulure' [failure of flower-setting] of vines [*R.A.M.*, x, p. 640] was very marked in 1936 in the Algiers district. Downy mildew [*Plasmopara viticola*] occurred in epidemic form in Oran, commencing about 15th May, and in certain parts of the Department of Algiers 15 to 18 copper sprayings interspersed with dust treatments were necessary. In the Bône region the use of potassium permanganate was requisite in certain cases for the control of *Oidium* [*Uncinula necator*: see preceding abstract].

BODE (H. R.). **Über die Entwicklungsgeschichte der intracellularen Stäbe im Cambium. Ein Beitrag zum Problem der Reisigkrankheit des Weinstocks.** [On the history of the development of intracellular cordons in the cambium. A contribution to the problem of the 'reisig' disease of the Vine.]—*Gartenbauwiss.*, xi, 3, pp. 272–288, 10 figs., 1 graph, 1937.

This is a detailed account of the author's cytological study of the occurrence and origin of intracellular cordons (which correspond to Sanio's bars in conifers) [*R.A.M.*, xvi, p. 704] in the wood and cambium of 'reisig'-diseased vines. As interpreted by him, the results indicate that the cordons begin to form in the cambium during mitosis, and involve degenerative changes in the substance of the cytoplasmic strands holding the nucleus in position and also in the nuclear spindle itself. The fact that the position of the cordon in the cell very nearly corresponds with that of the spindle axis during mitosis is considered to indicate that the whole nuclear structure, together with the cytoplasmic strands supporting it, is transformed into the cordon by a gradual accumulation in and on it of consecutive layers of cellulose (as indicated by staining reactions), inside which inclusions of an unknown nature are incorporated. No support was found for Petri's view that the cordons originate as 'corpi d'escrezione' [excretion bodies] in the cytoplasm of diseased vines. The author's opinion is further supported by the fact that in the sections of diseased cambium examined by him, numerous degeneration symptoms were seen in the dividing nuclei in cells adjoining those in which the cordons were in the process of formation.

In a discussion of these results, and also with reference to his own and other workers' records of intracellular cordons in the tissues of other dicotyledonous plants, the author states that it is not yet possible to decide whether these cordons are to be considered as specific symptoms of a certain class of pathological disorders or whether they are a sign of a general exhaustion of the organs or tissues involved, possibly due to the deficiency of certain elements, e.g., boron [ibid., xvi, p. 585], in the soil.

McDonald (J.). **Report of the Senior Plant Pathologist.**—*Rep. Dep. Agric. Kenya, 1936*, ii, pp. 1–12, 1937.

Replies to a questionnaire sent out to coffee-growers in Kenya provided further evidence of a close relationship between berry disease [*Glomerella cingulata*: *R.A.M.*, xi, p. 159; xvi, p. 453] and low temperature; opinions as to which flowering (long rains or short rains) produced the most susceptible crop differed according to the different localities.

Thorold confirmed his earlier observation that Elgon die-back [ibid., xvi, p. 87] occurs in different parts of Kenya, typical instances being noted at Sotik and Upper Kiambu. The condition may be considered as a form of 'hot and cold' disease [ibid., xv, p. 436], since the factors responsible for both appear to be similar, but the severest form of 'hot and cold' occurs where the growth is continually stunted owing to the presence of unfavourable factors throughout the year, whereas Elgon die-back appears to develop when such conditions occur only for brief periods, between which growth is normal. It was not possible, however, to reproduce the symptoms of die-back by exposure of the seedlings to low temperatures in the laboratory. Considerable progress has been made in the propagation of resistant types (both by seeds and asexually), and in the affected areas growers now possess nurseries containing resistant-type seedlings grown from these trees.

The results of inoculation experiments with leaf disease (*Hemileia vastatrix* [ibid., xvi, p. 171] showed that wild coffee (*Coffea eugenioides*) can remain practically symptomless even when infection has taken place.

A single pustule that developed on a wheat seedling artificially inoculated with *Puccinia graminis* was ascertained to be caused by a strain of the fungus that is rather more virulent than form K4 [ibid., xvi, p. 87], but does not, probably, constitute an entirely new form. When 35 samples of stem rust from different parts of Kenya were tested, all four forms were found to occur in one area or another, forms K2 [ibid., xvi, p. 89] and K4 again being the most prevalent. Form K4 was also found on a single sample of Kenya Standard wheat from Tanganyika. Wheat grown experimentally at an altitude of 11,000 ft. on Elgon was slightly affected by leaf rust [*P. triticina*] and yellow rust [*P. glumarum*].

Liral Crown flax at Nakuru and Kitale was affected by rust (*Melampsora lini*), a new record for Kenya; the damage to the fibre was occasionally somewhat serious, but there appeared to be little reduction in yield of seed.

Other new records included *Melanconium* [*Pleocyta*] *sacchari* [ibid., xvi, p. 774] on sugar-cane, splitting of peach believed to be due to *Armillaria mellea*, *Erysiphe polygoni*, *Peronospora viciae* [ibid., xiv, p. 340 *et passim*], and *Ascochyta pisi* on field peas, *E. polygoni* on cowpea, *Beniowskia sphaeroidea* [ibid., vii, p. 13: as *B. penniseti*] on *Pennisetum purpureum*, *Ustilago crameri* on *Setaria italica* [ibid., xvi, p. 247], and a virus-caused woodiness of granadilla (*Passiflora edulis*) [cf. ibid., xv, p. 593].

Waterston (J. M.). **Report of the Plant Pathologist, 1936. 1st October to 31st December.**—*Rep. Bd Agric. Bermuda, 1936*, pp. 22–27, 1937.

This report [*R.A.M.*, xv, p. 559] contains the following items of

phytopathological interest, apart from those already noticed from other sources. During the period under review yellow flat [or rosette] of lilies [loc. cit. and ibid., xvi, p. 752] became less prevalent, and there was little stump rot (*Phytophthora parasitica*) [loc. cit.], but there was a marked increase in the incidence of 'twist' [ibid., xiv, p. 559], a condition characterized by distortion and yellowing of the upper leaves and apparently aggravated by dry conditions. New York and Big Boston lettuces were affected by *Sclerotinia sclerotiorum* [ibid., xv, p. 477], the Iceberg variety being less susceptible, and a few lettuce plants were attacked by aster [*Callistephus chinensis*] yellows [ibid., xvi, p. 678]. *Fusarium oxysporum* was present on Bliss Triumph potato [ibid., xvi, p. 488] seed imported from Long Island, losses in the field in one instance amounting to 2½ barrels out of 8. In one locality Bonnie Best tomatoes (a very susceptible variety) were severely attacked by *Fusarium* [*bulbigenum* var.] *lycopersici* [ibid., xvi, p. 781], the outbreak having been favoured by continuous cropping to tomatoes without rotation. Damping-off (*Corticium solani*) of *Calendula* was prevalent in October but was checked by the use of formalin or Cheshunt mixture.

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B. C. Dep. Agric., 1936*, pp. P39–P45, 1937.

Diagnosis of the chlorotic disease of cherries recently reported from British Columbia as of virus origin [*R.A.M.*, xv, p. 480] is stated to be difficult during summer owing to the presence of powdery mildew [*Podosphaera oxyacanthae*] which may cause similar symptoms. In addition another trouble, also apparently due to a virus, is present, which causes little chlorosis but severe deformation of the leaves, which become deeply indented and in some cases are reduced to a mere ribbon.

In seed treatments of wheat against bunt [*Tilletia caries* and *T. foetens*], ceresan ½ and 4 oz. per bushel and methyl mercury oleate 4 gm. per bush. gave, respectively, 73·5, 72, and 74·2 per cent. seedling emergence, as compared with 59·7 per cent. in the untreated control, and reduced soil-borne infection from 37·4 per cent. in the controls to 26·5, 13·7, and 24·2 per cent. respectively.

In a comparative spraying test made with different chemicals against antirrhinum rust (*Puccinia antirrhini*) [ibid., xvi, p. 752] the best results were given by Bordeaux mixture and penetrol [ibid., xvi, p. 659], Bordeaux mixture and lethalate [ibid., xv, p. 653], and Bordeaux mixture alone (two applications of each with 10-day interval) with 0·7, 0·8, and 13·4 per cent. infection, respectively, as against 62·5 per cent. in the untreated control.

In varietal tests for resistance to scab (*Venturia pirina*) at Saanichton, Boussock, Dr. Jules Guyot, and Bartlett pears showed, respectively, 3·4, 3·8, and 6·9 per cent. infection against 66·5 per cent. for Anjou. Bouisol gave the best control of the disease (12·6 per cent. scab against 43·6 per cent. for lime-sulphur). Bouisol (4·5 pts. per 100 galls.) was slightly less effective than Bordeaux mixture against apple anthracnose (*Neofabraea malicorticis*) [ibid., xv, p. 481].

New records included *Septoria chrysanthemi* [ibid., xii, p. 677] causing a severe leaf blight on new strains of Shasta daisy (*Chrysanthemum maximum*), *Cytospora chrysosperma* [loc. cit.] on 6- to 8-year old

Lombardy poplars [*Populus nigra* var. *italica*], and *Pseudomonas* [*Bacterium*] *delphinii* [ibid., xv, p. 229] on *Delphinium* in Vancouver.

VAN HEUSDEN (W. C.). **Beknopt overzicht van de ondernemingscultures in het rayon Zuid-Sumatra gedurende 1936.** [An abridged survey of the plantation cultures in the region of south Sumatra in 1936.]—*Bergcultures*, xi, 20, pp. 713–719, 1937.

Rubber [*Hevea brasiliensis*] sustained heavy damage in south Sumatra in 1936 from the attacks of root fungi, including *Rigidoporus microporus* [*Fomes lignosus*: *R.A.M.*, xii, p. 720; xvi, p. 160], which also attacked *Derris elliptica*; *F. noxius* [ibid., xvi, p. 60]; *Ganoderma pseudoferreum*; and *Ustulina zonata* [ibid., xvi, p. 634]. Excessive thinness of the cortex, entailing marked liability to mechanical wounding, e.g., by tapping implements, is believed to be the primary cause of a complex disturbance known as 'bark and foot rot' associated with a species of *Phytophthora* and mainly affecting young bud grafts [ibid., xiii, p. 470]. In addition to precautions against injury in tapping operations, care in the application of protective substances to the bark is indicated. *P. faberi* [*P. palmivora*: ibid., xvi, p. 772] was prevalent, and *Oidium heveae* [loc. cit.] was widespread during August, especially in the Lampongs, where the regular use of sulphur gave good control in three plantations. *Marasmius equicrinis* [ibid., viii, p. 17] was reported from an estate in Lower Palembang.

Isolated attacks of *F. noxius* on coffee occurred both in the Lampongs and Palembang. *Rosellinia bunodes* [ibid., ix, p. 778 *et passim*] assumed a severe form, especially in Benkoelen, and *Xylaria thwaitesii* [ibid., xiv, p. 743] was observed sporadically. Top die-back (*Rhizoctonia* sp.) [ibid., xvi, p. 670] became increasingly prevalent in Benkoelen and Upper Palembang, particularly following heavy rains. *Corticium salmonicolor* [ibid., xvi, p. 634] and *C. gardeniae* [ibid., xvi, p. 453] were observed locally in the presence of intense humidity and dense shade.

Rosellinia bunodes was the chief agent of damage on tea roots [ibid., xv, p. 686], which were also attacked, especially at high elevations (about 1,400 m.), by *F. noxius* [ibid., xvi, p. 635]. Scattered instances of grey blight (*Pestalozzia theae*) and brown blight (*Colletotrichum camelliae*) [*Glomerella cingulata*: ibid., xvi, p. 128] were reported, while *P. leucodisca* was apparently the agent of a disease characterized by canker-like excrescences. *Cercosporella theae* [ibid., xiii, p. 216] was responsible for heavy damage on a Benkoelen estate, where 'bitten-off' disease of seedlings, attributed to an unfavourable soil reaction [ibid., xi, p. 749], was also in evidence.

LEVINE (M.) & CHARGAFF (E.). **The response of plants to chemical fractions of Bacterium tumefaciens.**—*Amer. J. Bot.*, xxiv, 7, pp. 461–472, 3 pl., 1937.

A fully illustrated account is given of the results of experiments, in which the authors studied the effect on the injured tissues of 25 species of plants, grown chiefly in the garden, of the chemical fractions of *Bacterium tumefaciens* [*R.A.M.*, xv, p. 706], as compared with that of the heteroauxins, indoleacetic, and indolepropionic acids [ibid., xvi, p. 730]. When applied to plants normally producing adventitious roots,

the heteroauxins induced a concentration of root development over the treated areas, but no discrete overgrowths were formed; small growths, bearing a close histological resemblance to crown gall tissue, were, however, occasionally produced on tomato, *Cosmos*, and kidney bean (*Phaseolus vulgaris*) plants treated with these substances, in addition to adventitious roots. Of the three chemical fractions of *Bact. tumefaciens*, the phosphatide fraction seemed to produce greater reaction than the others in the form of cell proliferations in the stems of the treated plants. In sunflower [*Helianthus annuus*] stems, the phosphatide fraction caused hyperplasia, while the fat fraction seemed to induce hypertrophy, and the polysaccharide fraction induced necrosis with limited cellular proliferation, which may be a secondary, reparative process. These results would indicate that sizeable overgrowths in plants can only be induced by the living bacteria, and, further, that some species of plants, like some species of animals, do not react to chemical stimulation by tumour production. In the light of our present knowledge, the histological structures induced in plants by chemical means cannot be directly related to animal cancer.

McFadden (E. S.). **False 'black chaff' of Wheat produced by inoculating with stem rust.**—*Phytopathology*, xxvii, 7, p. 801, 1937.

Varieties or hybrid strains of wheat with a specific type of mature plant resistance to *Puccinia graminis tritici* [*R.A.M.*, xv, p. 561], e.g., Hope and H–44, are liable to react to infection by the rust by the development of dark-coloured lesions simulating those of 'black chaff' (*Bacterium translucens* var. *undulosum*) [ibid., xvi, p. 243]. Microscopic observations indicate that the discoloration may result from the disintegration of the invading organism within the living cells of the host. Hypodermic inoculations of F_2 plants of an H–44 × Marquis cross with *P.g. tritici* showed all plants giving the 'black chaff' reaction to be resistant to the rust at maturity, though all had contracted infection. The 'black chaff' reaction can thus be used in certain wheat crosses as an 'ear mark' of mature plant resistance to black rust, thereby facilitating breeding for rust resistance, especially by the back-cross method.

Crépin (C.). **Le Blé Côte d'Or.** [The Côte d'Or Wheat.]—*Agric. prat.*, *Paris*, N.S., ci, 29, pp. 1035–1037, 2 figs., 1937.

In connexion with a brief statement on the characters of the new hybrid wheat, Côte d'Or, resulting from a cross between Vilmorin Paix 15–5 and a red-eared Burgundian strain, the writer mentions its virtual immunity from yellow rust [*Puccinia glumarum*] and its resistance to black rust [*P. graminis*].

Tillet (M.). **Dissertation on the cause of the corruption and smutting of the kernels of Wheat in the head, and on the means of preventing these untoward circumstances.**—Translated from the French by H. B. Humphrey.—*Phytopath. Class.* 5, 191 pp., 1937. Price $ 1.25.

This is a very readable and well-presented translation of Mathieu du Tillet's classical dissertation [cf. *R.A.M.*, xvi., p. 731] first published in 1755 on the causes of the corruption of wheat grains in the ear, in

which he experimentally showed that bunt [*Tilletia caries* and *T. foetens*] resulted from contamination of the seed with the bunt dust. The author also drew a clear distinction between smut [*Ustilago tritici*] and bunt of the crop, and gave a separate description of ergot of rye [*Claviceps purpurea*] showing that this disease also attacked other Gramineae. The original title page of the work is reproduced in facsimile.

WINTER (G.). **Zur Frage der Bedeutung biologischer und edaphischer Faktoren für das Auftreten der Ophiobolose des Weizens.** [On the question of the influence of biologic and edaphic factors on the development of ophiobolosis of Wheat.]—*Z. PflKrankh.*, xlvii, 7, pp. 369–380, 1937.

This is a summary of recent investigations on the influence of biological and edaphic factors on the development of *Ophiobolus graminis* on wheat [*R.A.M.*, xvi, p. 735]. Most of the papers referred to in the course of the survey have been noticed from time to time in this *Review*.

GARRETT (S. D.). **Brom-thymol blue in aqueous sodium hydroxide as a clearing and staining agent for fungus-infected roots.**—*Ann. Bot., Lond.*, N.S., i, 3, p. 563, 1937.

The following method of clearing, staining, and mounting fungus-infected roots of seedlings for microscopic examination is described. The roots are soaked in a solution of 0·04 per cent. brom-thymol blue in 4 per cent. aqueous sodium hydroxide for a period of not less than five minutes and then mounted in the same reagent, which clears and macerates the root tissues, allowing the root to be pressed out flat under the cover slip. Young hyphae, spores, sporangia, and the meristematic tissue of the root apices are stained blue by this method, preparations made according to which are not permanent.

GALLETTI (A. C.). **Sull' ingiallimento delle piantine di Frumento sotto i filari delle Vite. Indagini, considerazioni. (Nota preventiva).** [On the yellowing of Wheat seedlings under Vine rows. Investigations, considerations. (Preliminary note).]—*Riv. Pat. veg.*, xxvii, 5–6, pp. 149–160, 1937.

Wheat grown between vine rows near Modena is affected each winter by a characteristic yellowing and a retardation of growth. Every spring the plants attain the normal colour but remain weak and give poor yields. Plants grown in other soil brought to the same rows remained normal, while others grown in the same soil put down elsewhere developed characteristic symptoms of the condition. No causal organism was associated with the trouble, which the author attributes to the high copper content of the soil (0·417 gm. per kg. at ordinary levels, and 0·019 gm. per kg. at a depth of 40 to 50 cm.).

Owing to spraying with Bordeaux mixture all soils planted to vines contain copper, which, however, is present in an insoluble form, is confined to the superficial layers only, and has been shown to exercise no deleterious effect on plant life [*R.A.M.*, xiv, p. 76]. When the author grew wheat seedlings in clay and in sand to which was added copper sulphate solution in amounts equivalent to the quantity of

copper found in the soil in question, the effect of the clay in eliminating the toxicity of the copper was very striking. Under field conditions, the carbonates and colloids present in the soil are thought normally to immobilize the cation and render the copper entirely unassimilable.

Experiments in different localities showed that the prompt application of physiologically acid salts (especially iron sulphate) and nitrates induced a rapid return of the normal green colour of the affected wheat in the spring. The available evidence indicates that in the soil in question (which is alkaline) the copper brings about a true iron deficiency, the iron being rendered unavailable to the wheat. Nitrates being very soluble pass through the soil and reach the roots at levels where the effects of the copper are not felt, with the result that the roots are stimulated to function normally. For control, the author recommends applications of sulphur to the soil since the resulting sulphuric acid renders the iron present soluble during vegetation. The continuous application of iron sulphate should be avoided, but nitrates may be applied just before the spring to accelerate root activity.

SPRAGUE (R.). **A further note on the fungus causing a white foot rot of Wheat and Oats.**—*Phytopathology*, xxvii, 7, pp. 798–800, 1937.

A comparative study of cultures of *Gibellina cerealis* isolated from wheat at the Rothamsted Experiment Station [*R.A.M.*, xv, p. 433], and the fungus responsible for white foot rot of wheat and oats in Oregon [ibid., xiv, p. 26] has afforded definite proof that the two organisms are distinct. The former produces a mounded, slow growing, pale grey colony with numerous perithecia, while the latter is characterized on potato dextrose agar by a dirty white, loose mycelial growth in which sclerotia (but no fruiting stage) develop resembling those of *Rhizoctonia* [*Corticium*] *solani*. The Oregon fungus was tentatively identified as *G. cerealis* on the basis of named cultures of the fungus received from Italy and is now considered probably to belong to *Rhizoctonia*.

JOHNSTON (C. O.), FELLOWS (H.), & MELCHERS (L. E.). **Reaction of certain varieties of Wheat to infections of powdery mildew at Manhattan, Kansas, 1932–35.**—*Plant Dis. Reptr*, xxi, 11, pp. 201–211, 1937. [Mimeographed.]

As a result of observations made in rust [*Puccinia* spp.] and foot rot [*Ophiobolus graminis* and other fungi] nurseries at Manhattan, Kansas, from 1932 to 1935, inclusive, tabulated data are presented on the reaction of a large number of wheat varieties to naturally occurring powdery mildew (*Erysiphe graminis*) [*R.A.M.*, xvi, pp. 49, 519]. The disease is a minor one locally, found as a rule only in wet seasons or in lodged spots in low-lying fields, but in the nurseries in question it was frequently very severe and abundant, as early sowing resulted in autumn infections and the delay in harvesting necessitated by experimental conditions favoured perithecial development. The following varieties showed resistance: Iowin and Smithsonian (hard red winter); Michigan Amber selection 29–1–1–1 and Nittany (soft red winter); Bomen, Dixon selection, Hope, Lambrigg, Norka, Progress, and Supreme (all outstanding for resistance among the hard red spring

varieties); Sapporo spring No. 1 and several selections of Illinois No. 1 (soft red spring) and Barwang, Carrabin, Currawa, and Malan's (white spring). All the emmer (*Triticum dicoccum*) and einkorn (*T. monococcum*) selections were strongly resistant and *T. timopheevi* was not infected.

PETIT (A.). **Observations sur le traitement des grains de Blé contre le charbon interne (Ustilago tritici).** [Observations on the treatment of Wheat seed against loose smut (*Ustilago tritici*).]—*Rev. Path. vég.*, xxiv, 2, pp. 175–185, 1937.

Tests carried out in Tunis in 1936 on the control of loose smut of wheat (*Ustilago tritici*) by hot-water treatment [*R.A.M.*, xvi, p. 661] showed that (with the Florence × Aurora hybrid) infection was reduced to at least eight times less than in untreated material as a result of 40 (or better still 50) minutes' immersion at 45° C., followed by 10 minutes at 52°, the efficacy of the treatment depending on the sanitary condition of the seed. The method of using one long immersion (nearly 2 hours at 45°) gives complete control of the disease but injures the germination, while the short immersion method permits of treating large quantities of seed without loss of time, and reduces the difficulty of drying, as it increases the moisture content of the seed by only 27 to 30 per cent., as against an increase of nearly 40 per cent. for the single long treatment. The long treatment has the advantage of allowing small quantities of smut-free seed to be prepared which, after two or three years' cultivation, will give a clean crop. To secure normal germination of seed treated by the short method the humidity must gradually be reduced to normal (12 to 13 per cent.), the environmental conditions in which germination occurs must be at an optimum, and the dried seed must be dusted with copper carbonate to preserve it against the attacks of soil fungi.

EKSTRAND (H.). **Trådklubba på vintersäd. Sklerotiesjuka pa fodergräs.** [*Typhula* on winter cereals. Sclerotial disease on fodder grasses.]—*Växtskyddsnotiser Växtskyddsanst., Stockh., 1937*, 1, pp. 3–5, 3 figs., 1937.

The species of *Typhula* (formerly referred to *T. graminum*) commonly observed on winter cereals in southern and central Sweden is stated to agree with *T. itoana* [*R.A.M.*, xv, p. 348], whereas an entirely different form was isolated in May, 1936, from rye in a northern locality. It is characterized by circular, brownish-black sclerotia, ½ to 1 mm. in diameter, and occurs also on timothy [*Phleum pratense*], *Stellaria media*, *Arabis arenosa*, *Thlaspi arvense*, and certain grasses, while a sample of wheat attacked by the same fungus, which is named *T. borealis*, was received from another district of the same northern province.

At the same time and in the same region a species of *Sclerotinia* (? *S. borealis* Bub. & Vleugel), with sclerotia 3 to 6 by 1½ to 2 mm., was found on rye grass [*Lolium perenne*] and other fodder grasses.

VOLK (A.). **Untersuchungen über Typhula graminum Karst.** [Investigations on *Typhula graminum* Karst.]—*Z. PflKrankh.*, xlvii, 6, pp. 339–365, 14 figs., 1937.

In Germany *Typhula graminum* [see preceding abstract] seldom

occurs in a destructive form on barley (its chief cereal host), on which the damage is usually confined to a few plants in a stand. The roots are partially or wholly destroyed and the outer leaves and sheaths permeated by the mycelium, which further kills the secondary haulms or impedes their emergence by agglutination of the leaf primordia. Both roots and shoots are covered with sclerotia, ordinarily of very variable form and size, though one strain of the fungus from East Prussia is consistently characterized by a uniformly spherical shape, a diameter of 1 to $1\frac{1}{2}$ mm., and a light brown coloration. The yield reduction due to the paucity of haulms and poor seed production averages 6 per cent. Slight infection by *T. graminum* frequently paves the way for subsequent invasion by *Ophiobolus graminis*.

The minimum, optimum, and maximum temperatures for the development of *T. graminum* were found to be above 0°, 8°, and 25° C., respectively. Free hyphal formation (leading to a rapid flat extension of the fungus) was shown to be promoted by darkness, a high degree of humidity, and a temperature range of 3° to 8°. The septate, hyaline hyphae form anastomoses and clamp-connexions in profusion, while thick-walled mycelial strands are not uncommon in older cultures. The typical sclerotia of the fungus develop best on a medium of 2 per cent. agar, 3 per cent. biomalt, and 2 per cent. calcium carbonate; they may arise either through the dense intermingling of numerous branching hyphae (this being evidently the common method in nature) or by the swelling of the hyphae. A neutral reaction proved to be the most favourable for sclerotial growth (minimum P_H 3·5). The sclerotia from pure cultures remained viable for 16 months, while outdoor material was still capable of growth after 25. The fungus does not tolerate the drastic withdrawal of oxygen.

Attempts to induce fructification in *T. graminum* gave somewhat inconclusive results. Only in nine-months-old agar cultures exposed to full daylight were mycelial strands formed corresponding to those described by [Ruth] Remsberg and [C. W.] Hungerford [*R.A.M.*, xiii, p. 222]; of these the branched were consistently sterile while only a few of the unbranched gave indications of rudimentary hymenial formation, with sterigmata and possibly spores, though the last-named were not detected. Sufficient evidence is, however, available to classify the fungus as a *Typhula* and not a *Sclerotinia*.

Inoculation experiments in 1930 and 1933 showed that the heaviest infection occurs on early winter barleys (Janetzki's Early and Kalkreuth Universal), other susceptible varieties being Friedrichswert Berg, Eckendorf Mammoth II, Mahndorf Victoria, Manshold Groningen, and Peragis; of the three summer barleys tested, only Ackermann's Bavaria was slightly attacked. Winter wheats and rye sustained little damage, summer wheat and oats none. Of the grasses used in the experiments the most susceptible were *Hordeum murinum*, *Poa annua*, and *P. trivialis*, but mild infection also occurred on a number of others, including *Phleum pratense* and *Lolium perenne*. The sclerotia are the chief sources of natural infection.

Control measures should be directed towards counteracting the environmental conditions favouring the pathogen. Thus dryness of the upper soil layers should be induced by hoeing or harrowing in the

autumn and spring. Late sowing (October or early November at Königsberg, East Prussia) combined with sparse planting and shallow planting contribute to the suppression of free mycelial development, while the application of readily assimilable nitrogenous manures in the spring stimulates adventitious root development and so reduces the extent of the injury caused by the pathogen.

THREN (R.). **Gewinnung und Kultur von monokaryotischem und dikaryotischem Myzel. Ein Beitrag zur Physiologie und Genetik des Gerstenflugbrandes (Ustilago nuda (Jens.) Kellerm. et Sw.).** [Isolation and growth in culture of uninuclear and binuclear mycelium. A contribution to the physiology and genetics of Barley loose smut (*Ustilago nuda* (Jens.) Kellerm. & Sw.).]—*Z. Bot.*, xxxi, 7–8, pp. 337–391, 1 pl., 10 figs., 1937.

The author gives a detailed account of his studies in pure culture of the progenies of 20 collections of *Ustilago nuda* from as many localities in Germany and elsewhere, widely differing in climatic and other conditions. On exposure to temperatures between 1° and 2° C. the promycelial cells did not fuse together, but became deeply constricted at the cross walls, in extreme cases leading to the complete separation of the four haploid cells [cf. *R.A.M.*, xvi, p. 240]. When germinated separately the four cells produced haplonts which always segregated in their type of growth in the ratio 2 : 2, each type being of a different sex. When paired together lines of different sexes showed hyphal fusions, the behaviour of the sexes indicating anisogamous somatogamy. Both sexes grew approximately equally well on malt extract agar, but the minus strain alone was able to develop on potato agar and on malt extract gelatine, the failure of the plus strain to develop being presumably attributable to the lack in the medium of some substances necessary for its growth. The dicaryonts produced by paired lines of different sexes for the most part showed great stability when cultured on artificial media, and differed considerably in their type of growth from that of the haplonts. The dicaryonts could also be obtained and propagated farther in pure culture by various combinations of haploid mycelia. The type of growth obtained either from single spores or from massed spore collections agrees entirely with that of the dicaryonts obtained by pairing the promycelial cells. Segregations which occasionally occur in uninuclear mycelia are always shown by a change in the type of growth.

HONECKER (L.). **Die Bestimmung der physiologischen Rassen des Gerstenmehltaues (Erysiphe graminis hordei Marchal).** [The determination of the physiologic races of Barley mildew (*Erysiphe graminis hordei* Marchal).]—*Phytopath. Z.*, x, 2, pp. 197–222, 6 figs., 1937.

Continuing his studies on barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, xv, p. 568], the writer found that the standard assortment used by Mains and Dietz for the determination of physiologic specialization in the fungus in the United States [ibid., ix, p. 643] did not give satisfactory results in Germany, and it was further necessary, in view of the multiplicity of colour and structural changes induced in the

foliage by the disease, to amplify the criteria for the various reaction types established by these authors. The assortment now used by the writer consists of eight varieties, viz., Hohenfinow, Weihenstephan C.P. 127/422, *Hordeum spontaneum nigrum*, Gopal C.J. 1091, Ragusa D.R. 34–40, Sweden 860, Samaria, and Peruvian C.J. 939/d. On the basis of their pathogenicity to these varieties nine physiologic races of *E.g. hordei* have been separated from the 101 collections examined between 1933 and 1936, of which five were described in previous papers while the remaining four (F, G, H, and J) are newly reported. Race G is grouped with B, E, and C, H and J with A and D, but F stands alone. All the new races were encountered once only, F being apparently a spontaneous mutant capable of attacking the otherwise highly-resistant *H. spontaneum nigrum*, while each of the others originated in scientific institutions or breeding establishments with a large number of varieties under cultivation. Race A continues to predominate and to be the cause of the prevailing mildew epidemics.

SHANDS (R. G.). **Longevity of Gibberella saubinetii and other fungi in Barley kernels and its relation to the emetic effect.**—*Phytopathology*, xxvii, 7, pp. 749–762, 1 graph, 1937.

A fully tabulated account is given of the writer's studies in Wisconsin on the longevity of *Gibberella saubinetii* and other fungi in barley kernels in relation to the emetic effect of such food on pigs [*R.A.M.*, xvi, p. 525]. *G. saubinetii* was found to retain its nauseating action 56 months after the barley was harvested, at which time, according to plating tests, the fungus had been non-viable for at least 26 months. The duration of viability varied considerably among the different fungi used in the tests and also in the same organism from different sources. *G. saubinetii*, for instance, was viable in inoculated material 27 months after harvesting, whereas the same fungus from naturally infected barley from Iowa did not appear on the plates 20 months after harvest. Neither *Fusarium culmorum* nor *F. avenaceum* developed from inoculated kernels 28 months after harvest. An unidentified *F.* sp. and an *Alternaria* remained viable for 57 months under experimental conditions, while the latter was further isolated 75 months after harvesting from an Iowa sample. *Helminthosporium gramineum* was viable after 75 and 123 months, respectively, in Iowa and Wisconsin material, while other *H.* spp. appeared in the plates after 51 months. Storage conditions evidently affect fungal longevity to some extent. For example, *Alternaria, Helminthosporium*, and *Penicillium* spp. lost their viability sooner in the seed-house than in the laboratory, whereas the reverse was the case with *G. saubinetii*.

DE HAAN (J. T.). **Untersuchungen über das Auftreten der Keimlings-Fusariose bei Gerste, Hafer, Mais und Reis.** [Studies on the occurrence of seedling fusariosis in Barley, Oats, Maize, and Rice.]—*Phytopath. Z.*, x, 3, pp. 235–305, 28 graphs, 1937.

A comprehensive, fully tabulated account is given of the writer's investigations at the Federal Technical College, Zürich, on the influence of temperature on the seedling blight of barley, oats, maize, and rice caused by *Fusarium herbarum* [*F. avenaceum*] (Doyer's strain),

F. culmorum (Wickens's strain), and *F. moniliforme* [*Gibberella moniliformis*] (Bolle's strain). The work fell into three parts and involved studies on the effect of temperature on (*a*) the growth of the fungi, (*b*) the development of the hosts, and (*c*) the degree of infection [*R.A.M.*, xii, p. 564; xv, p. 788, *et passim*].

In a modified Richards's solution *F. avenaceum* withstood the lowest temperature, mycelial growth being perceptible even at 3° C., while the corresponding minima for *F. culmorum* and *G. moniliformis* were 9° and 6°, respectively. The optimum temperatures for *F. culmorum* and *G. moniliformis* were 27° and 27° to 30°, respectively; *F. avenaceum* reacted less sharply and grew equally well throughout the range from 18° to 27°. The maximum for *F. avenaceum* was 33° and for the other two species 36°. On a solid (malt agar) medium the temperature relationships of the three pathogens were similar to the foregoing.

The optimum temperature for the germination of Klettgau barley was between 12° and 18°, for Argovia barley 9° to 15°, for Brune de Mont Calme oats 15·2°, for Goldkorn oats 3° to 9°, for Golden Bantam maize 21°, for Rhine Valley maize 15·5° to 27·5°, for Si Landjah rice 30°, and for Pasir Nangka rice 33° to 36°. The optimum soil temperatures for barley, oats, maize [ibid., ii, p. 537], and rice growth were found to be 21°, 24° to 28°, 30°, and 31° to 36°, respectively.

Stunting of barley by *F. culmorum* occurs chiefly at the higher temperature ranges which conduce to the prevalence and virulence of this species; seedling development is also apt to be more or less adversely affected. *G. moniliformis*, on the other hand, tends to increase the longitudinal growth both of barley and rice, especially Si Landjah [ibid., xi, p. 332]. *F. avenaceum* and *F. culmorum* both stimulated the development of oats, the former at soil temperatures up to 23° and the latter between 7° and 26°, while Brune de Mont Calme responded similarly to infection by *G. moniliformis*. Stunting of maize followed severe infection by *F. avenaceum*, and *F. culmorum* produced similar effects, even in the absence of noticeable pathogenic symptoms. *G. moniliformis*, on the other hand, conduced to vigorous growth in Rhine Valley maize throughout practically the entire temperature range of the experiments. The development of rice was not influenced by *F. culmorum* or *F. avenaceum* under the conditions of the tests.

Leukel (R. W.). **Seed treatment experiments with Oats naturally and artificially inoculated with smuts.**—*Tech. Bull. U.S. Dep. Agric.* 568, 16 pp., 1937.

A tabulated account is given of experiments from 1932 to 1936, inclusive, to test the efficacy of 16 fungicides in the disinfection of the seed of 11 oat varieties against covered (*U. levis*) [*U. kolleri*] and loose [*U. avenae*] smuts [*R.A.M.*, xv, p. 347]. The most satisfactory results, both from the standpoint of smut control and the effect on germination and stand, was obtained, with one exception, with new improved ceresan. Liquid formalin (1 in 320 for 5 mins.) and formalin spray (1 qt. half strength formalin to 50 bush.) were also effective but frequently injurious to the seed. Good control was also afforded by the formalin dusts tested, especially when they were applied two days or more before sowing, and their occasional failure to give satisfaction is

attributed to the loss of volatile matter on standing. Formacide (a paraformaldehyde dust containing a catalytic agent which, in the presence of moisture, causes paraformaldehyde to revert to gaseous formaldehyde) gave promise of being a good disinfectant for oats; the treatment costs about 3·4 cents per bush. of seed, which is somewhat higher than that for new improved ceresan. Prolonged storage of oats treated with the above-named dusts is not recommended, unless the grain moisture content is about 14 per cent. or less, is thoroughly aerated a few days after treatment, and the storage room is cool and dry.

An outstanding feature of the investigations was the relatively high percentage of smut in the plants raised from seed inoculated by the evacuation method, as compared with inoculation without vacuum or with dry spores, and also the occasional failure of even the better disinfectants to give satisfactory control with such seed. Examination of treated grains showed that in the evacuation method the caryopsis and the inner side of the glumes were literally darkened with the smut spores, which were particularly abundant about the embryo end, while no spores were found beneath the glumes of the seeds inoculated with dry spores, although in this case the spores were much more abundant on the outside of the glumes. The fact that the percentage of smutted heads was not materially increased by artificial inoculation in Norton oats suggests that the smut which developed in the crop must have been caused by natural infection at blossoming time [ibid., vii, p. 503].

Bowman (D. H.), Martin (J. H.), Melchers (L. E.), & Parker (J. H.). **Inheritance of resistance to Pythium root rot in Sorghum.**—*J. agric. Res.*, lv, 2, pp. 105–115, 4 figs., 1937.

A tabulated account is given of greenhouse experiments at Manhattan, Kansas, and Arlington, Virginia, and field tests at the Garden City Sub-station of the Kansas Agricultural Experiment Station, in which the reaction to the root rot caused by *Pythium arrhenomanes* [*R.A.M.*, xvi, p. 740] was studied in the progenies of twelve crosses between sorghum varieties resistant or susceptible to infection. The results indicated that reaction to the disease is determined by a single major factor difference, and that susceptibility is partly dominant and is inherited independently of coleoptile (seedling) colour and of hybrid vigour (heterosis) of the progenies.

Tomkins (R. G.) & Dreyer (D. J.). **A note of low temperature breakdown of Grapefruit from Somerset West.**—*Fmg S. Afr.*, xii, 133, pp. 157–159, 3 figs., 1937.

An investigation was carried out in 1935 on a number of cases of specially picked Somerset West grapefruit to determine a possible correlation between certain orchard factors and the low temperature pitting [*R.A.M.*, xiv, p. 754; cf. ibid., xvi, p. 742] observed on the arrival of similar fruit in England in the previous year. Fruit from the outside of the trees was found to be more susceptible to this type of injury than that from the inside (33 as compared with 2 per cent. pitting). The other factors considered (including methods of packing and storage duration) were without appreciable effect on the condition of the fruit.

BOTERO (R. O.). **Apartes del informed sobre reconocimiento fitopatologico del Quindio (Caldas).** [Extract from the report on the phytopathological survey of Quindio (Caldas).]—*Rev. cafetera Colombia*, vi, 97–99, pp. 2186–2188, 6 figs., 1937.

The author records the occurrence in the Quindio district of Colombia of *Rosellinia pepo* [*R.A.M.*, xiv, p. 84; xv, p. 213] on a species of *Erythrina* used as a shade tree for coffee, and also on *Inga* sp. This is stated to be the first record of the fungus from Colombia.

BOTERO (R. O.). **Preliminaries al estudio del 'mal de tinta' en el Cafe.** [Preliminary note on the study of the 'ink disease' of Coffee.]—*Rev. cafetera Colombia*, vi, 93–96, pp. 2131–2132, 1937.

In giving a brief account of the symptoms of a disease of coffee, locally known under the Spanish equivalent of ink disease, the author states that it is prevalent over the whole of Colombia, but frequently causes very important losses from Santander southwards. While the trouble has not yet been definitely diagnosed, he inclines to the view that it is caused by *Phytomonas leptovasorum* [*R.A.M.*, xiv, p. 218; xv, p. 292]. A thorough study of the disease under Colombian conditions is urgently advocated.

McDONALD (J.). **Coffee in Kenya.**—vi + 210 pp., 28 pl., 6 graphs, 2 maps, Nairobi, Govt Printer, 1937. Price 5*s*.

In Part V (pp. 148–190) of this book, compiled jointly by the officers of the agricultural services in Kenya, and edited by J. McDonald, the latter gives a semi-popular account of the parasitic and non-parasitic diseases which attack the crop in that Colony.

SUCHORUKOFF [SUKHORUKOFF] (K.) & STROGONOFF (B.). **The activators of peroxidase in sick plants.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xv, 9, pp. 563–565, 1937.

Most diseases due to facultative parasites are stated to cause an increase of oxidation reaction at the points of infection and in studying this reaction in relation to *Verticillium albo-atrum* on cotton the authors state that peroxidase activity (estimated in c.c. of N/10 potassium permanganate per gm. of raw material, by the pyrogallol method) was 11·4 and 10·0 in the roots and petioles, respectively, of infected plants, as against 5·0 and 5·1 in those of healthy plants. Further tests by the same method indicated that the activity of peroxidase in the mycelium of *V. albo-atrum* and *V. dahliae* grown on a saccharo-mineral medium is comparatively low, and that the diffusion of the ferment into the substratum is negligible, so that the increase in the activity of the peroxidase in the diseased organs is due to the action of the fungus on the oxidizing system of the cell. Experiments with a peroxidase of known high activity, prepared from an aqueous extract of horse-radish (1 in 10) showed that, besides the small amounts of peroxidase, *V. albo-atrum* discharges into the nutrient medium a large amount of an activator of the horse-radish peroxidase, the accumulation of which was greatest in the medium of old cultures (58 days). There was also evidence of the presence of certain fermentation inhibitors in the mycelium. Biochemical tests showed a high activity of the peroxidase in

the parenchyma cells adjoining vessels invaded by *V. albo-atrum*, resulting in their necrosis and destroying the resistance of the cells to the developing parasite.

BRUMPT (E.). **Précis de parasitologie. Cinquième édition.** [A compendium of parasitology. Fifth edition.]—xii + 2139 pp., 4 pl. (2 col.), 1073 figs., 2 diags., 6 graphs, 4 maps, Paris, Masson et Cie, 1936. Price Fr. 200.

Part III (pp. 1571–2070) of this comprehensive, fully documented compendium of parasitology, which is stated to have been brought up to date (1935) by an exhaustive perusal of the latest relevant literature, deals with the scientific, clinical, and therapeutic aspects of the fungal parasites of man and animals.

DOWDING (ELEANOR S.) & ORR (H.). **Three clinical types of ringworm due to Trichophyton gypseum.**—*Brit. J. Derm.*, xlix, 7, pp. 298–307, 2 pl., 2 figs., 1937.

A culture of *Trichophyton gypseum*, the agent of 67 per cent. of all cases of human ringworm in Alberta, Canada [*R.A.M.*, xvi, p. 316], was obtained from scales on the fingers of a female patient and used as the type for the present investigations after verification by other medical mycologists. The subspherical or piriform microconidia (aleuriospores) measured 2·8 to 3·5 by 2·5 μ and the 4 to 10-septate clavate to cylindrical macroconidia (fuseaux) 40 to 75 by 7 to 10 μ; the colonies were light buff-coloured and granular. Fifteen other cultures, isolated from the infected tissues of patients suffering from three different types of ringworm, were also identified as *T. gypseum* on the basis of gross appearance of the cultures, microscopic features of the mycelium and spores, and hyphal fusion with the type culture [ibid., xi, p. 458, *et passim*]. Nine of the cultures differed from the type in the texture (finely granular or silky) or colour of the mycelium (dead white to brownish-vinaceous), pigmentation of the nutrient medium (Morocco red in one instance), or in microscopic characters, such as the absence of macroconidia. In one strain the macroconidia were abnormally short and wide (30 to 40 by 10 to 15 μ). No correlation could be traced between the clinical type of ringworm induced by a given strain and its variations on Sabouraud's medium.

OYAMA (T.). **Favus der unbehaarten Haut, durch Achorion gypseum verursacht.** [Favus of the glabrous skin caused by *Achorion gypseum*.]—*Jap. J. Derm. Urol.*, xli, 2, p. 82, 1937.

Achorion gypseum [*R.A.M.*, xvi, pp. 100, 101] was isolated from herpes tonsurans foci in a nine-year-old boy and inoculated with positive results into rabbits, guinea-pigs, rats, mice, and cocks.

GERENCSÉR (N.). **Gemeinsame Infektion eines ekzematösen Herdes mit Kaufmann-Wolfschem Pilz und Oidium.** [Joint infection of an eczematous focus with the Kaufmann-Wolf fungus and *Oidium*.]—*Börgyógy. Szemle*, xv, pp. 25–26, 1937. [Hungarian. Abs. in *Zbl. Haut- u. GeschlKr.*, lvi, 8, p. 567, 1937.]

Epidermophyton Kaufmann-Wolf [*R.A.M.*, xvi, p. 458] and *Oidium*

[*Candida*] *albicans* were isolated simultaneously from eczematous lesions on the right shin and foot of a female patient. Both hyphae and budding forms were present in the scales.

BALLAGI (I.). **Neuere Gruppierung der Dermatophyton-Pilze auf Grund des Systems von Sabouraud.** [A revised classification of the dermatophytic fungi on the basis of Sabouraud's system.] *Orv. Hetil.*, *1937*, pp. 314–316, 1937. [Hungarian. Abs. in *Zbl. Haut- u. Geschl Kr.*, lvi, 7, p. 480, 1937.]

The writer is persuaded from a study of the systems for the classification of the dermatophytes devised by Sabouraud, Ota and Langeron, Castellani, Grigoraki, and others [cf. *R.A.M.*, xv, pp. 151, 368; xvi, p. 39, *et passim*] that in the interests of both the clinical and microscopic-botanical aspects of the subject, the first-named author's method of grouping should be retained. It is, however, advisable to introduce transitional groups between the four main ones. The pathogenic dermatophytes would thus fall into the following sections: I *Trichophyton* (*a*) of human origin, comprising *T. crateriforme* and its satellites, *T. pilosum*, *T. sulphureum*, *T. exsiccatum*, *T. polygonum*, *T. circonvolutum*, *T. fuscum sulcatum*, *T. cerebriforme*, *T. plicatile*, *T. citreum*, *T. araneideum aurescens*, and *T. infuscatum*; (*b*) of animal origin, including *T. gypseum* and *T. niveum* with their respective varieties, *T. equinum*, *T. vinosum*, and *T. rosaceum*. II *Microsporon* represented by *M. audouini*, *M. umbonatum*, *M. helveticum*, *M. tardum*, *M. pertenue*, and *M. depauperatum*. III *Achorion* (*A. schoenleini* and *A. violaceum*). IV *Epidermophyton*, with *E. inguinale* [*E. floccosum*] and *E. clypeiforme* [*E. floccosum*]. Transitional group 1, characterized from a botanical standpoint by an *Achorion*-like growth habit, comprises *T. violaceum* and its var. *glabrum* [*T. glabrum*], *T. balcaneum*, *T. nigrum*, and *T. faviforme* vars. *album*, *ochraceum*, and *discoides* [*T. album*, *T. ochraceum*, and *T. discoides*]. Group 2, microscopically resembling the animal *T.* strains or *E.* spp., is represented by *M. lanosum*, *M. felineum*, *M. fulvum*, *M. equinum*, *M. villosum*, *M. tomentosum*, *M. pubescens*, *A. quinckeanum*, *A. gypseum*, and *A. gallinae*. Group 3 consists of *Trichophyton*-like species of *Epidermophyton*, viz., Kaufmann-Wolf's fungus, *E.* [*T.*] *interdigitale*, *E.*[*T.*] *rubrum*, *E. plurizoniforme* [*T. rubrum*], *E. lanoroseum* [*T. rubidum*], *E.* [*T.*] *gypseum* and its var. *flavum*, and *E.* [*T.*] *niveum*.

BLACK (S. H.) & EDDY (BERNICE E.). **Human infection with Monilia. Report of a case with cultural data.**—*J. Lab. clin. Med.*, xxii, 6, pp. 584–593, 6 figs., 1937.

Full clinical and cultural data are presented on a case of skin and lung infection, with the production of subcutaneous myxomatous tumours and possible bone involvement, in a negro. The causal organism, which grew well at P_H 3·8 to 5 on Sabouraud's or dextrose tartaric acid agar at 37° C., forming cream-coloured, rugose colonies of oval or rounded budding cells, 8 μ in diameter, produced in older cultures a sparse septate mycelium giving off lateral branches and buds and terminal buds, occasionally accompanied by chlamydospores. Laboratory animals reacted positively to inoculation by the organism, which

is tentatively identified as *Monilia* [*Candida*] *pinoyi* [*R.A.M.*, xv, p. 502].

Martin (D. S.), Jones (C. P.), Yao (K. F.), & Lee (L. E.). **A practical classification of the Monilias.**—*J. Bact.*, xxxiv, 1, pp. 99–128, 3 pl., 1937.

This is an expanded and tabulated account of the writers' studies on 153 unidentified strains of *Monilia* [*Candida*], mostly from human sources in the United States (six from England), which were compared with 19 'known strains' supplied by various investigators. A preliminary report on this work has already been noticed [*R.A.M.*, xvi, p. 381], but the following additional items are of interest. The six species with which all except three of the organisms were found to be identifiable were *C. albicans* [ibid., xvi, p. 748], *C. parapsilosis*, *M. candida* [*C. vulgaris*: ibid., xvi, pp. 40, 99, 177], *C. krusei* [ibid., xvi, p. 611], *M. stellatoidea* Jones and Martin 1937, and *M. mortifera* n. comb. (*Mycocandida mortifera*, *M. onychophila*, *M.* sp., *C. mortifera* and *Monilia onychophila*). *M. stellatoidea* forms a creamy growth on Sabouraud's agar at 37° C., stellate colonies with thick, radiating 'arms' on blood agar, and large, ball-like spore clusters resembling those of *C. albicans* on maize meal agar; acid and gas are produced in the presence of glucose and maltose. The branched mycelium of *M. mortifera* is very similar to that of *C. parapsilosis*; the colonies produced by the former on Sabouraud's agar are creamy, development is poor on blood and maize-meal agars, and glucose, sucrose, and lactose are utilized with acid and gas formation. Full details are given of the authors' technique for the identification of the pathogens under observation.

Coccidioidal granuloma.—*Publ. Hlth Rep., Wash.*, lii, 12, pp. 334–336, 1937.

Following up the investigations of M. Dorothy Beck (1931) on coccidioidal granuloma (*Coccidioides immitis*) in California [*R.A.M.*, x, p. 520; see also xvi, p. 745], the California Department of Public Health has recently issued a further report on the disease (*Wkly Bull. Calif. Bd Hlth*, xvi, 2, p. 6, 1937). Up to 1st July, 1936, 450 cases with 224 deaths were recorded in the State, 301 (66·8 per cent.) originating in Fresno, Kern, Kings, Tulare, and Los Angeles Counties. Males are more liable (384 cases or 85 per cent.) than females to coccidioidal granuloma, especially in the age groups from 25 to 55 (275 cases or 61 per cent.). Of the total number of cases recorded, 65·5 per cent. involved outdoor workers, and the fungus was isolated from soil samples, thus bearing out the theory that it is carried in the soil. Slight variations have occurred in the racial incidence of the disease since 1931, the percentage of foreign-born whites affected having decreased slightly while that of Filipinos has doubled.

Conant (N. F.) & Martin (D. S.). **The morphologic and serologic relationships of the various fungi causing dermatitis verrucosa (chromoblastomycosis).**—*Amer. J. trop. Med.*, xvii, 4, pp. 553–570, 3 pl., 1 fig., 1937.

Thirteen of the 17 strains of fungi from chromoblastomycosis of wide

geographical distribution were shown by comparative studies to belong to *Hormodendrum pedrosoi*, two to *Phialophora verrucosa*, and one each to *H. langeroni* and *H. compactum* [*R.A.M.*, xvi, p. 747]. Full descriptions of these fungi are given. The recognition of the three last-named species presented no difficulties by reason of their distinctive conidiophores, but the classification of *H. pedrosoi* was complicated by its variety of conidial structures. On careful examination, however, the *H.* type of formation was found to predominate in this species, which further produced in 8 of the 13 strains studied phialids terminated by a cup-like formation, identical in size with those of *P. verrucosa* and bearing ovate conidia 2 to 2·5 by 1·5 to 2 μ, probably representing spermatia. *Trichosporium pedrosianum*, *T. pedrosoi*, *Gomphinaria pedrosoi* Dodge 1935, *H. algeriensis* [ibid., vii, p. 639], *Botrytoides monophora*, and *Phialoconidiophora guggenheimia* are all regarded as synonyms of *H. pedrosoi*. Serological studies based on the sera of rabbits immunized with two typical strains of *H. pedrosoi* and one each of the other fungi under observation showed that complement-fixing antibodies were present for the homologous antigen of each fungus. The sera immunized with *H. pedrosoi* and *H. compactum* contained not only a high titre of complement-fixing antibodies for their respective antigens but also for each other, whereas in the cases of *P. verrucosa* and *H. langeroni* the antibodies were present in appreciable degree only for the homologous species.

CROWELL (I. H.). **Relative susceptibility of Lilac species and varieties to Microsphaera alni.**—*Plant Dis. Reptr*, xxi, 8, pp. 134–138, 1937. [Mimeographed.]

A list is given, based on studies made from 1933 to 1936 at the Arnold Arboretum, of about 300 species and varieties of lilac classified as immune from, or slightly, moderately, or highly susceptible to, powdery mildew (*Microsphaera alni*).

ULLSTRUP (A. J.). **Histological studies on wilt of China Aster.**—*Phytopathology*, xxvii, 7, pp. 737–748, 5 figs., 1937.

The roots of healthy China aster (*Callistephus chinensis*) plants resistant to wilt (*Fusarium conglutinans* var. *callistephi*) [*R.A.M.*, xvi, p. 256] were anatomically indistinguishable from those of healthy susceptible varieties. Penetration of the latter is effected largely between the root cap cells and the epidermal cells in the region of elongation. Occasionally direct penetration of the outer wall of an epidermal cell was observed, but initial ingress through root hairs was not detected. Penetration in the resistant strain was very limited in extent but did not differ in manner or situation from the process in susceptible varieties. In old susceptible plants in wilt-infested soil considerable decay of the meristem and part of the region of elongation followed penetration, but hyphal extension occurred chiefly in the xylem. At an advanced stage of the disease the mycelium migrated into other stelar tissues and invaded the secondary roots, but the cortex was only slightly involved until wilting became complete. Resistant plants grown in infested soil for over three months developed a few restricted root lesions. No morphological barrier to the advance of the

hyphae could be detected, and resistance is therefore presumably attributable, as in the case of other vascular *Fusarium* wilts, to physiological properties of the host protoplasm.

Downy mildew on China Aster in Texas.—*Plant Dis. Reptr*, xxi, 8, p. 141, 1937. [Mimeographed.]

All the China aster (*Callistephus hortensis*) [*C. chinensis*] plants in the fields of a commercial grower in Hidalgo County, Texas, were affected by *Basidiophora entospora* Roze & Cornu which caused a loss of about 30 per cent., though injury was reduced by the application of Bordeaux mixture and copper dusts. This would appear to be the first record of a downy mildew on this host, at least in the United States.

Some diseases reported on ornamentals.—*Plant Dis. Reptr*, xxi, 13, p. 251, 1937. [Mimeographed.]

Among the diseases recorded in this paper are *Cercospora nymphaeacea* Cke & Ell. found on water lily (*Nymphaea mexicana*) in Texas, and *Guignardia bidwellii* [*R.A.M.*, xvi, p. 17] on *Ampelopsis* [*Parthencissus*] *tricuspidata* in the District of Columbia.

VAN EEK (T.). **Wortelrot van Viola tricolor L. max. hort.** [Root rot of *Viola tricolor* L. *max. hort.*]—Thesis, Univ. of Amsterdam, 83 pp., 9 pl., 7 graphs, 1937. [English summary.]

In most cases of damping-off of seedlings and wilting, foliar discoloration, and arrested development of older plants of cultivated pansies (*Viola tricolor* and other *V.* spp.) in Holland, the root system is extensively involved. Among the 45 fungi isolated on 2 per cent. plain or cherry agar may be mentioned *Pythium de Baryanum* [*R.A.M.*, xiv, p. 38], *P. aphanidermatum*, *P. perniciosum*, *P. intermedium* [ibid., viii, p. 187], *P.* spp. A and B, *Brevilegnia gracilis* n.sp., *B. macrospora* n.sp. [both with Latin diagnoses], *Fusarium culmorum*, *F. bulbigenum*, *F. oxysporum*, *F. solani* vars. *martii* and *minus*, *F. equiseti*, *F. scirpi* and its var. *filiferum*, *Cylindrocarpon radicicola* [ibid., xv, p. 605], *C. didymum*, *C. obtusispora*, *Septomyxa affinis* [ibid., viii, p. 342], *Rhizoctonia* [*Corticium*] *solani* [ibid., xv, p. 705], and *Thielavia basicola* [ibid., xv, p. 467]. Of these the most virulent were experimentally shown to be *P. de Baryanum*, *P. aphanidermatum*, *P. perniciosum*, *B. gracilis*, *F. culmorum*, and *C. solani*.

B. gracilis is characterized by branched hyphae, 2 to 5 μ in diameter, cylindrical sporangia, 60 to 75 by 12 to 15 μ, non-motile spores, 4 to 7 μ in diameter, usually terminal oogonia, 17 to 30 μ in diameter, average 20 to 27 μ, with one or occasionally two oospores, not completely filling the oogonium, 15 to 24 μ in diameter, mostly 17 to 21 μ, and both diclinous and androgynous antheridia (one or two per oogonium), 15 to 30 by 7 to 10 μ. In *B. macrospora* the hyphae are also branched, 2 to 5 μ in diameter, the cylindrical sporangia measure 70 to 80 by 12 to 15 μ and contain 30 to 50 spores, 4 to 7 μ in diameter; the terminal or intercalary oogonia (usually the former) are 18 to 40 μ in diameter, average 26 to 31 μ, with one or rarely two oospores, 15 to 28 μ in diameter, mostly 20 to 24 μ, not entirely occupying the oogonium, and there are diclinous, mostly terminal antheridia, generally one or two

per oogonium. Both species of *Brevilegnia* also form germinable bodies of an indeterminate nature; in the case of *B. gracilis* they are darker in colour than the other organs of the fungus, while in that of *B. macrospora* they are round to cylindrical, 30 to 75 by 20 to 30 μ. *P.* sp. A lacks sporangia, oogonia, and antheridia, the terminal or intercalary conidia measure 16 to 38 μ in diameter (mean 26 μ), and, according to S. F. Ashby, agree with those of *P. de Baryanum* var. *pelargonii* [ibid., x, p. 732]. In *P.* sp. B sporangia are also absent; the oogonia are usually terminal, 15 to 38 μ in diameter, mostly 25 to 31 μ, and contain one oospore, 13 to 32 μ in diameter, and one or two antheridia, 10 to 17 by 6 to 9 μ. The hyphae of both species are 2 to 5 μ in diameter.

In inoculation experiments on Schneewittchen and Rotkäppchen pansies in pots of sterilized and unsterilized soil the pathogenicity of *T. basicola*, described by Thaxter (*Rep. Conn. agric. Exp. Sta.*, p. 161, 1891) and Reddick (*Trans. Mass. hort. Soc.*, p. 85, 1913) as an agent of root rot in the United States, was inconsiderable. The virulence of the *Cylindrocarpon* spp. used in the tests declined progressively in culture and no infection was obtainable after a year. All the above-mentioned *F.* spp., when grown on a rice medium, formed substances highly toxic to the pansy; in soil inoculations these are introduced with the pathogens into the substratum and tend to obscure the symptoms of exclusively fungal origin. A culture of *F. culmorum* a fortnight old proved highly pathogenic in soil inoculation tests, whereas one of a month caused no infection. Few or no symptoms developed, moreover, on plants raised from seed inoculated with a rice culture of *F. culmorum* and left to germinate in the soil. This loss of virulence is attributed to deterioration, induced by exhaustion of the food supply, adverse changes in reaction, and the elaboration of specific substances toxic to the fungus itself (staling) [ibid., ii, p. 328, *et passim*]. All the Phycomycetes isolated during these investigations were generally much less active in unsterilized than in sterilized soil, and the infective capacity of *B. gracilis* was completely inhibited by simultaneous inoculation of the soil with a rice culture of *S. affinis* on rice, but not with the same organism on 2 per cent. agar. Infection with *F. scirpi* and its var. *filiferum* and *F. equiseti*, however, was more severe in unsterilized than in sterilized soil.

Owing to the large number of fungi involved and to the influence of environmental factors, it is difficult to correlate a given symptom with a definite pathogen. *Fusarium* infection, however, is generally recognizable by the discoloration and stunting of the foliage and petioles. *F. culmorum* is an exception to the rule, causing rapid and intensive wilting and root decay, though the plants may recover if the fungus is exposed to unfavourable conditions.

PAPE (H.). **Stammfäule der Gloxinie und ihre Verhütung.** [The stem rot of *Gloxinia* and its control.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 27, pp. 306–307, 4 figs., 1937.

A species of *Phytophthora*, the exact identity of which is still uncertain, is responsible for increasingly heavy damage to *Gloxinia* in north Germany, where a large nursery recently reported the collapse of over 2,000 half-grown plants from the soft brownish- to greenish-black

stem rot due to the fungus [cf. *R.A.M.*, xiv, p. 637; xv, p. 478]. Infection appears to be favoured by excessive humidity and insufficient aeration of the stem base associated with the use of impermeable soil, too copious watering, heavy shading, dense planting, inadequate greenhouse ventilation, and unbalanced nitrogenous manuring. The blue-flowered types appear to be particularly susceptible to stem rot and the white ones very resistant; in general the disease is most severe on highly cultivated selections and spares the ordinary commercial varieties such as Kaiser Friedrich, Kaiser Wilhelm, and Defiance. Control measures, based on the avoidance of the above-mentioned cultural errors, are briefly indicated.

Green (D. E.). **Downy mildew on Antirrhinum majus.**—*Gdnrs' Chron.*, cii, 5037, pp. 27–28, 1937.

After pointing out that downy mildew (*Peronospora antirrhini*) of cultivated *Antirrhinum majus* plants was first reported in the British Isles from southern Ireland in May, 1936, the author states that in June, 1937, severely affected plants were received at the Royal Horticultural Society's laboratory at Wisley from three sources in one locality in England. The disease causes a marked check to the growth of the young shoots. In young plants the lower leaves are of normal size, while the upper parts consist of very small leaves on shortened shoots, these leaves curling downwards and inwards at the tips, with the result that the plants present a crippled, stunted appearance. A few varieties show a fairly long central stem with small, curled leaves. The affected plants tend to break from the base and produce numerous secondary shoots. From the information available it appears that the disease attacks young nursery stock, on which it should be sought; infected plants should be destroyed and the remainder sprayed with Burgundy mixture.

Harrar (J. G.). **Some unusual diseases of ornamentals in Virginia.**—*Plant Dis. Reptr*, xxi, 11, p. 217, 1937. [Mimeographed.]

Snapdragon [*Antirrhinum majus*] growing in the greenhouse in Virginia under conditions of high temperature and humidity became blighted as a result of infection by a species of *Cladosporium*, the pathogenicity of which was established. Small pustules developed on the leaves and stems, covering the former under optimum conditions. Stem canker and leaf spot of the same host in the field and in greenhouses were caused by a species of *Phoma*, pycnidia of which occurred on the stems, pods, and leaves of all affected plants [cf. *R.A.M.*, x, p. 130]. Seven distinct strains of *Verticillium* [ibid., xiii, p. 737] were found to be associated with blue rot of box (*Buxus sempervirens*), of which three were ascertained by inoculation tests to be actively parasitic.

Beaumont (A.) & Gregory (P. H.). **A new leaf-spot disease of Gerbera.**—*Gdnrs' Chron.*, cii, 5037, p. 28, 1 fig. [on. p. 29], 1937.

In 1936, *Gerbera jamesoni* hybrids growing near Penzance were slightly affected by *Ascochyta gerberae* Maffei which produced on the leaves brown, minutely granular spots, 2 to 10 mm. in diameter and surrounded by a purple margin most conspicuous in the early stages.

The spots subsequently coalesced, and many of the older leaves shrivelled up. This appears to be the only record of the disease since its original appearance in Italy in 1912.

DODGE (B. O.). **A dry-rot disease of Opuntia.**—*J. N. Y. bot. Gdn*, xxxviii, 451, pp. 170–172, 1 fig., 1937.

Prickly pear (*Opuntia*) segments collected in the Rocky Mountains, New Mexico, in 1936 and destined for propagation became covered with coalescent, black spots, each surrounded by a brown zone $\frac{1}{16}$ in. wide, which in turn was encircled by a pale yellowish band of similar extent, presumably representing, respectively, the intermediate stage and final limits of fungal extension. The black area was densely studded with minute, black pycnidia, or possibly spermogonia. The mycelium was mostly situated in the epidermis, which it completely destroyed, so that the fungus appeared subcuticular. Eventually a tough, black, crust-like dry rot spread completely over one side of the segments. The disease is stated to be capable of completely destroying plants of the variety from New Mexico under favourable conditions.

WEIMER (J. L.). **Effect of the dwarf disease on the Alfalfa plant.**—*J. agric. Res.*, lv, 2, pp. 87–104, 10 figs., 1937.

The histological studies discussed in this paper showed that the more or less extensive yellow discoloration of the wood in the roots of lucerne plants affected with dwarf disease [*R.A.M.*, xvi, p. 103] is largely due to the presence of gum, similar in character to wound gum, in the vessels; in the late stages of the trouble, however, there is also a yellow stain which diffuses into the surrounding tissues. At first the gum is limited to a few vessels in one or more bundles of the outer xylem in the upper part of the tap-root or crown, but before death of the plant the whole root system is involved, many of the vessels in the outer xylem being completely plugged with the gum. Some of the gum is evidently exuded by adjacent cells into the vessels, where it appears in the form of globules or thin sheets along the inner surface of the walls. Certain vessels contain numerous bacterium-like bodies, very similar, chemically, to the gum in which they are embedded, and differing from bacteria in several respects.

The water content of the tops of healthy lucerne plants was found to be slightly higher than that of diseased tops, the reverse applying to the roots. Healthy plants transpired about 1·6 times as fast as the diseased, the same difference being also found in the amount of water that could be pulled through segments of healthy and diseased roots of approximately equal diameter. Differences in acidity observed between the healthy and diseased plants were probably due to a difference in growth. Roots and tops affected with dwarfing had a higher ash content than healthy plants grown under similar conditions, and it was shown that in diseased roots starch gradually diminishes until it finally disappears just before the lucerne plant dies.

KLINKOWSKI (M.) & LEHMANN (H.). **Kranke Luzerne.** [Sick Lucerne.] —132 pp., 16 figs., Neudamm, J. Neumann, 1937. Price RM. 4.50.

In view of the increasing cultivation of lucerne in Germany, the

authors present a practical manual describing the diseases and pests of the plant and indicating measures for their control. The diseases discussed include certain disorders of physiological origin, mosaic, and 14 due to fungi, and a useful key for their determination by symptoms is furnished.

McWhorter (O. T.). **Zinc sulfate treatments for 'little leaf' condition of deciduous fruits.**—*Rep. Ore. St. hort. Soc. 1936*, pp. 121–124, [? 1937. Abs. in *Chem. Abstr.*, xxxi, 16, p. 5931, 1937.]

Zinc tacks, placed 0·5 in. apart and arranged spirally round the tree, are recommended for the control of little leaf in small deciduous fruit trees [*R.A.M.*, xiv, p. 768; xvi, p. 755]. Zinc sulphate sprays (10 to 12 lb. crystallized zinc sulphate plus 5 lb. lime per 100 galls.) give satisfactory results when there is risk of foliar scorching. Severely affected trees are greatly benefited by spraying with zinc sulphate (1 lb. per 100 galls.) with or without lime. In old trees the condition may be combated by boring holes 1·5 in. deep and 0·375 in. in diameter, spaced 4 to 5 in. apart, round the tree trunk at soil-level and filling with zinc sulphate crystals to within 0·5 in. of the outside.

Kearns (H. G. H.) & Marsh (R. W.). **A summary of fruit spraying programmes. I.**—*Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 75–89, [1937].

In connexion with the spray service recently instituted by the Long Ashton Research Station in collaboration with the County Agricultural Departments of the Bristol Advisory Province, a summarized account is given of the standard spray programmes at present in use in the Province against pests and diseases of apple, pear, plum, cherry, black and red currants, gooseberry, raspberry, loganberry, blackberry, and strawberry. These programmes are designed to supplement information that is to be issued each season through the service and to inform the growers beforehand of the materials likely to be required.

Kearns (H. G. H.), Marsh (R. W.), & Martin (H.). **Combined washes. Progress report. III.**—*Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 99–117, [1937].

Further extensive field trials with combined insecticidal-fungicidal sprays carried out during 1936 at Long Ashton and elsewhere [*R.A.M.*, xv, p. 735] demonstrated that in general a wash containing lime-sulphur and a refined (grade G) petroleum oil emulsified with sulphite lye may be safely applied to apple varieties tolerant of sulphur, though the addition of the emulsion did not increase the control of scab [*Venturia inaequalis*]. In one trial in which the oil was included in all the sprays against scab serious defoliation resulted, but sufficient successful experiments have now been carried out to permit the combined wash to be recommended for those circumstances in which it can economically replace separate insecticidal and fungicidal sprays.

Swarbrick (T.). **The effect of spraying methods upon the cost of applying fruit tree washes.**—*Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 139–148, [1937].

In an extensive investigation carried out at Long Ashton from 1928

to 1935, inclusive, the cost and efficiency of the semi-portable and mobile systems of orchard spraying are compared in considerable detail, the relevant data being tabulated [cf. *R.A.M.*, xvi, p. 547]. The semi-portable spraying unit consisted of a moveable $3\frac{1}{2}$ h.p. sprayer working at 250 lb. pressure with a maximum output of 7 galls. per minute, to which were attached overground steel mains or long lengths of rubber hose. This apparatus was used as a mobile unit in 1930–2, and in 1933–6 a large mobile unit, with an 8 h.p. sprayer delivering 20 galls. per minute, was employed. The results showed that the semi-portable system required at least six men, and gave a slow rate of spraying owing to the time lost in moving the pipes. The adoption of the mobile system reduced the number of workers required to three at most and halved the time necessary to spray a given plot, with the result that the cost of application was greatly reduced. The cost of labour and horse or tractor hire for spraying a plot of 2 acres of mature bush apples using the semi-portable system ranged from £3 17*s.* 6*d.* per application in 1928–9 to £2 in 1931–2, while in 1933–4 and 1934–5, using the mobile system and the same heavy application the cost was, respectively, £1 9*s.* 9*d.* and £1 4*s.* 3*d.*; in 1935–6 a much lighter application, using the mobile system, cost only 17*s.* 8*d.* With the mobile system and suitable spray guns each worker has an output of 10 to 14 galls. per minute; on mature bush apples and pears outputs of 6 to 8 galls. per minute per man have been maintained at Long Ashton since 1933. On large standard trees in grass orchards far larger outputs are obtained.

Goodwin (W.), Pizer (N. H.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab: Allington Pippin and Newton Wonder, 1936.**—*J. S.-E. agric. Coll., Wye,* xl, pp. 9–17, 1937.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xv, p. 813] conducted in Kent in 1936, Allington Pippin trees given two pre- and two post-blossom applications of home-made Bordeaux mixture (8 : 12 : 100) and cotton-seed oil Bordeaux emulsion (as used in previous tests) gave, respectively, 17·4 and 22·3 per cent. scabbed apples, as against 88·5, 65·7, and 86·6 scabbed fruits in three unsprayed control plots. Newton Wonder trees similarly treated gave, respectively, 30 and 36·9 per cent. scabbed apples as against 92·9, 63·2, and 89·4 per cent. scabbed fruits in three unsprayed control plots.

Owing, possibly, to the very wet season, the Bordeaux mixture and the cotton-seed oil Bordeaux emulsion caused, respectively, 15·1 and 6·2 per cent. russeting on the Allington Pippin crop; on the Newton Wonder apples russeting was negligible. Scab infection was early in 1936 and the parts affected included sepals, petals, and stamens. Reviewing the results obtained in 1933–6 the authors consider that cotton-seed oil Bordeaux emulsion is probably not inferior as a fungicide to Bordeaux mixture.

Rothe (G.). **Mineralöle im Pflanzenschutz II.** [Mineral oils in plant protection. II.]—*NachrBl. dtsch. PflSchDienst,* xvii, 6, pp. 46–48, 1937.

Certain points of interest in connexion with the phytopathological

use of mineral oils are briefly referred to in this paper. Improved control of apple scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xvi, p. 685] was obtained on White Transparent and Altland Pancake by the admixture of oil with the Bordeaux mixture spray as follows: 5 per cent. winter oil A + 2 per cent. Bordeaux on 15th April, 2 per cent. summer oil + 1 per cent. Bordeaux on 5th May, and 2 per cent. summer oil + 0·3 per cent. Bordeaux on 3rd and 26th June. The percentage of healthy White Transparent fruits harvested from the plot so treated was 88·4 compared with 2·0, 36·3, and 14·5 from those left unsprayed, receiving the fungicide alone, and treated with oil alone, respectively, while the percentage of severe scab was only 0·8 as against 58·5, 5·2, and 7·1, respectively, for the other treatments. In the case of Altland Pancake 85·2 per cent. of the combined oil and fungicide-treated fruits were healthy compared with 6·0, 76·4, and 23·4 for the control, Bordeaux alone, and oil alone plots, respectively, and there was only 0·3 per cent. severe infection as against 37·1, 1·2, and 5 per cent., respectively, for the other treatments.

BIRMINGHAM (W. A.). **Soft or deep scald of Apples.**—*Agric. Gaz. N.S.W.*, xlviii, 7, pp. 397, 406, 2 figs., 1937.

The apple variety most susceptible to soft or deep scald [*R.A.M.*, xv, p. 300; xvi, p. 687] is stated to be Jonathan, but the condition has also been recorded in Australia on Rome Beauty, Stone Pippin, Dunn's, Stayman-Winesap, Winesap, Northern Spy, Northwestern Greening, Wealthy, and Blue Pearmain. It is generally characterized by patches or banded areas of slightly depressed brown tissue, partly or completely encircling the surface of the apple. Jonathan apples become affected if picked too early. Delayed storage strongly favours the condition, which develops chiefly at temperatures under 36° F., especially those approaching freezing point. Control consists in timely picking, immediate cold storage at a temperature not below 36°, and aeration with ventilation in cool storage.

SAVAGE (C. G.) & BROADFOOT (H.). **Internal cork of Apples. Soil dressings of borax give excellent results.**—*Agric. Gaz. N.S.W.*, xlviii, 7, pp. 387–390; 8, pp. 447–452, 12 figs., 1937.

Complete control of internal cork [*R.A.M.*, xvi, p. 686] on Granny Smith and Democratic apples growing in New South Wales orchards where the disease had long been present was given by soil applications of 1 to 3 lb. of borax per tree. Two Granny Smith trees each given 1 lb. borax and 1 cwt. sheep manure yielded, respectively, 17 and 15 bushels of sound fruit, as against only 24 bushels for 19 trees not given borax. When $\frac{1}{4}$ oz. dry, granulated borax was inserted in the root of one tree, sound fruit developed only on the same side as the hole, but the root was badly damaged. The treated trees made much more annual growth and had darker foliage and better-coloured fruit than the untreated, the foliage and fruit also remaining attached longer on the former than the latter. No trace of the disease was found on 16 varieties, including Delicious, Northern Spy, and Winesap, whereas Granny Smith, Milbert, and Fameuse were severely affected.

The authors recommend that the trees should be given an application

of $\frac{3}{4}$ to 1 lb. borax in early spring, and that the mechanical condition of the soil should be improved by a dressing of 3 to 5 tons of organic manure per acre or by sowing and ploughing in leguminous green manures.

WALLACE (T.). **Orchard factors affecting the quality of fruits.**—*J. Soc. chem. Ind., Lond.*, lvi, 31, pp. 695–697, 1937.

In connexion with a general discussion of certain inherent, environmental, and cultural factors affecting the quality of fruits (especially apples), the writer states that the practice of bark-ringing induces extreme susceptibility to superficial scald, flesh breakdown, and 'cork', while superficial scald is also favoured by unduly early picking. Apples exposed to the maximum of sunshine have been found more susceptible to bitter pit [*R.A.M.*, xvi, p. 688] than shaded ones, which tend to suffer from storage rots (including *Gloeosporium album*) [ibid., xvi, p. 756]. Storage rots are also prevalent on terminal fruits. Flesh breakdown and bitter pit frequently occur on large fruits and on those from light crops, the former also being invaded by rots, while core flush is a defect of small apples [ibid., xvi, p. 260].

RAMSEY (G. B.). **Fruit and vegetable diseases on the Chicago market in 1936.**—*Plant Dis. Reptr, Suppl.* 101, pp. 81–96, 1937. [Mimeographed.]

In these notes on a large number of fruit and vegetable diseases observed in the Chicago market during 1936 it is stated that the most interesting decay of pears noted was *Sporotrichum* [cf. *R.A.M.*, x, p. 675] rot of Anjou pears from Medford, Oregon, marketed in February. Up to 40 per cent. of the fruits in some boxes showed dark brown to black, circular, depressed spots $\frac{1}{4}$ to $1\frac{1}{4}$ in. diameter, and $\frac{1}{4}$ to $\frac{1}{2}$ in. deep. The affected internal tissues were yellowish-to dark brown, and soft to spongy, according to size. At room temperature many of the spots increased in diameter at the rate of 1 mm. per day.

A few Californian tomatoes received in October showed minor blemishes due to *Bacterium punctulans* [ibid., xiii, p. 279].

BODINE (E. W.) & DURRELL (L. W.). **The Maynard Plum—a carrier of the Peach mosaic virus.**—*Science*, N.S., lxxxvi, 2221, p. 81, 1937.

Buds from each of six externally normal Maynard plum trees growing in a peach mosaic-infested area of the Palisade district, Colorado [*R.A.M.*, xvi, pp. 88, 543], were grafted on 4th September, 1936, into five one-year-old peaches. On the commencement of growth in the following spring, 15 seedling peaches grafted with buds from parent plum trees Nos. 1, 5, and 6 showed typical mosaic symptoms, while 15 others grafted with buds from plum trees 2, 3, and 4, and also 28 peach seedlings used as controls remained healthy. This experiment was carried out in an isolated planting remote from the mosaic centre.

On 23rd March, 1937, roots from the six Maynard plums were grafted on roots of 34 two-year-old peach seedlings. Peach mosaic symptoms were observed on the following 15th May on 15 of the 17 peach trees root-grafted from plums 1, 5, and 6, while the 17 grafted with plums 2, 3, and 4, and 33 peach seedling controls remained normal.

Maynard plums may thus apparently be carriers of the peach mosaic virus without showing any pathological symptoms.

WILLISON (R. S.). **Peach canker investigations. III. Further notes on incidence, contributing factors, and related phenomena.**—*Canad. J. Res.*, xv, 7, pp. 324–339, 1 diag., 4 graphs, 1937.

In summarizing the results of intensive annual surveys from 1929 to 1936, inclusive, in the laboratory orchards at St. Catharines, Ontario, in relation to peach canker (*Valsa cincta*) [*R.A.M.*, xiii, p. 246; xv, p. 447], the author states that the relative importance of the different primary sources of the cankers varies from year to year. During the first two or three years from planting, pruning wounds and injuries following *Verticillium* wilt [ibid., xiii, p. 246] usually serve as the main means of entry for canker, but with the development of a profusely branching aerial system, other points of origin, such as dead twigs and fruit pedicels, become dominant and either continue to increase in importance from year to year or are in their turn superseded by others. Still other sources, such as mechanical injuries, winter injuries, re-infections following the removal of cankers, split or broken branches, crotches, and borer insect injuries, did not show any definite trend, but varied in importance according to conditions prevailing in the different years. Cankers which in the earlier communications had been described as originating from dead buds, have since been shown to have been leaf scar infections, the indications being that these scars remain vulnerable for a time after leaf fall, because of a temporary absence of wound periderm in the leaf base; there was evidence, however, that the development of scars from this source is dependent on an infrequent coincidence of physiological and meteorological factors. Some insects, such as the oriental fruit moth (*Laspeyresia molesta*), the shot-hole borer (*Scolytus rugulosus*), and the peach borer (*Synanthedon exitiosa*) may cause injuries which frequently become cankered later; the lesser peach borer (*S. pictipes*) is seldom a primary parasite but may stimulate the necrotic processes by destroying the callus in existing cankers. Pruning experiments indicated that wounds made during the autumn were most susceptible to natural infection with the canker organism. Serious cankers may also arise from winter injury, three types of which at least were observed, and the incidence of peach canker and winter injury may be significantly increased by prolonging the period of open cultivation. It was further established that from 75 to 85 per cent. of the open cankers of all ages overwintering on the trees remain active, the general tendency, however, being for the cankers to become less active with increasing age. The paper terminates with a brief discussion of control measures, the conclusion being that surgical treatment of important cases, combined with the dressing of the wound with disinfectants, is of considerable value.

SALMON (E. S.) & WARE (W. M.). **The honey fungus (Armillaria mellea) attacking fruit trees and Hops; with observations on Pholiota squarrosa in Cherry orchards.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 18–26, 6 figs., 1937.

Armillaria mellea [*R.A.M.*, xvi, p. 716] is not so common on fruit

trees in south-eastern England as might be supposed, but during the last seven years three serious outbreaks have occurred, and are here recorded in detail.

The first took place in a mixed orchard of cherry, apple, and plum trees at Faversham, Kent, where 14 dead or dying cherry trees, 25 to 30 years old, were removed in 1929, and several apple trees and one plum tree were attacked the following year, infection having spread from five or six old elm stumps in the vicinity. The second occurred in 1933 on large cherry trees at Sittingbourne, Kent, sometimes in association with *Pholiota squarrosa* [ibid., xiv, p. 803], which was destructive in the same orchard in 1931, where *Ganoderma applanatum* was also commonly present in 1932. *A. mellea* was also found fruiting near dead plum trees which had replaced cherries grubbed in 1931–2, proceeding directly from the old cherry roots. The third outbreak of *A. mellea* caused considerable damage to old apples, plums, and damsons at Wye, and grubbing has been necessary every year since 1933.

In 1935, Fuggle hops at Goudhurst were attacked by *A. mellea* [ibid., xv, pp. 478, 605] and in 1936, *P. squarrosa* was widely present on old, dying cherry trees at Tenterden.

Swarbrick (T.) & Berry (W. E.). **Further observations on the incidence and spread of reversion and big bud in Black Currants.**—*Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 124–132, 1 fig., [1937].

After pointing out that the available evidence suggests that reversion in black currants [*R.A.M.*, xv, p. 731] is due to a virus and may be spread by the black currant mite (*Eriophyes ribis*) causing big bud, the authors present data obtained over a period of eight years in a large plantation which showed that when reverted bushes were planted in fixed positions the new cases that occurred arose mostly in close proximity to them. Edina black currants appeared to be more, and Baldwin less, susceptible to reversion than French. Big buds developed almost exclusively on reverted bushes, but not before reversion had become apparent. It would appear that many new infections arise through the activities of *E. ribis*, but the disease may perhaps be spread by other means, and it is possible that the bushes that became affected had the disease in a latent form when planted.

Richards (B. L.) & McKay (H. H.). **Strawberry root rot in Utah.**—*Proc. Utah Acad. Sci.*, xiii (*1935–6*), pp. 17–19, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvii, 3, p. 354, 1937.]

Isolations from over 4,000 root-rotted strawberry plants in Utah [*R.A.M.*, xvi, p. 760] most commonly give *Fusarium orthoceras* and species of *Rhizoctonia*, *Cylindrocarpon*, *Hainesia*, and *Coniothyrium*. Inoculation experiments showed that the first-named fungus, *R.* [*Corticium*] *solani*, and *Cylindrocarpon obtusisporum* induce typical black rot, while *Hainesia* may be partly responsible for the condition. Locally, all four are prevalent in the soil. *Olpidium brassicae* and a Phycomycetous mycorrhizal fungus [ibid., xv, p. 449] were also found in the cortical layers of the affected roots.

Anagnostopoulos (P. T.). Ἡ κερκοσποριώσις τῆς Συκῆς (Φυλλόπτωσις, σῆψις καρπῶν). [Cercosporiosis of the Fig (phylloptosis, sepsis of the carpels).]—*Hort. Res., Athens, 1936*, 4, pp. 170–175, 3 figs., 1936. [English summary. Received October, 1937.]

Cercospora bolleana is reported to have been responsible for a serious leaf fall and fruit rot of figs [*R.A.M.*, v, p. 584] in Messenia, Greece, in the autumn of 1935 and the summer of 1936. The disease may be combated by two applications of Bordeaux mixture (2–2–100) in May and June, followed by others if rainy weather ensues.

Stevens (H. E.). **Control of Mango blossom-blight and anthracnose.**—*Proc. Fla hort. Soc.*, xlix, pp. 125–130, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvii, 3, p. 355, 1937.]

Tests carried out in Florida with different fungicides showed that good commercial control of mango blossom blight and anthracnose [*Glomerella cingulata*: *R.A.M.*, xv, p. 592] was given by four to five applications of Bordeaux mixture (4–4–50). The dormant spray is necessary as a clean-up treatment and to protect the bloom cluster during its early stages. Copper-lime dust (20–80) gave very good control under some conditions but was difficult to apply except in still air.

Rada (G. G.). **La enfermedad de la antracnosis del Palto en Moquegua.** [The anthracnose disease of Avocado in the Moquegua valley.]—*Cart. Minist. Fom., Lima*, 30, 22 pp., 11 figs., 1937.

A phytopathological inspection in 1935 of 16 orchards in the valley of the Moquegua, which is stated to be the chief centre of avocado cultivation in Peru, showed that from 10 to 100 per cent. of the avocado trees in them were infected with anthracnose (*Physalospora* [*Melanops*] *perseae*) [*R.A.M.*, ix, p. 63; cf. ibid., xiv, p. 124], the symptoms caused by which are popularly described. Recommendations for the control of the disease include the elimination of badly diseased trees, surgical treatment of the others, and periodical applications of 1 per cent. Bordeaux mixture. [Control measures against this disease have now been made compulsory: *Int. Bull. Pl. Prot.*, xi, 8, p. 182, 1937.]

Davies (C.) & Smyth-Homewood (G. R. B.). **Investigations on machinery used in spraying. Part IV. Nozzles.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 50–57, 9 graphs, 1937.

In these further studies [*R.A.M.*, xvi, pp. 396, 694] the authors describe how variations in the details of spray nozzles influence spray form and general performance.

It was found that a vortex plate with six 11/64 in. holes drilled at 45° gave a more symmetrical spray pattern than one with four 14/64 in. holes, and both gave a more even spray than a 2-hole plate. The insertion of a central hole to both 4- and 6-hole vortex plates increased range and output, provided the disk orifice was large enough to take the greater flow. The dimensions of the orifice in the disk of a nozzle limit the output, whatever the number and size of the vortex holes. Atomization and carry were appreciably affected by the design of the vortex plate even when the disk reached its limit of output.

With increasing size of nozzle disk (up to 18/64 in.), using a 4-hole

vortex plate, output increased as the outlet in the disk was enlarged, but the range fell progressively with increased apertures after a certain maximum size was reached, owing to the wide cone of spray produced by the large apertures. When, however, a vortex plate was used provided with an opening drilled axially, the reduction in range was followed by an increase in the case of the largest disks. The spray became progressively finer as the total area of the vortex holes became smaller and the pump pressure greater.

The diameter of the eddy-chamber had no effect on spray formation so long as the distance between the vortex holes remained unchanged and all other factors constant, but the nearer the vortex holes were to the centre of the plate ($2\frac{1}{4}$ in. diameter) the greater were the output and carry, though there appeared to be no difference in atomization. When the number of vortex holes was increased to sixteen (each 6/64 in.) the symmetry of all the patterns produced was nearly perfect with all pump pressures and sizes of disk orifice. Both the output and range were greater with 4 holes in the vortex plate than with 16.

Taylor (G. G.). **Application of orchard sprays. IV. Spray coverage.**— *N.Z.J. Agric.*, lv, 1, pp. 32–41, 5 graphs, 1937.

In the experiments discussed in this, the fourth paper of this series [*R.A.M.*, xvi, p. 694], a spray consisting of 7·5 lb. hydrated lime in 100 galls. water was used to study the bearing of volume delivery at the nozzle and duration of spraying on the coverage of the foliage with the spray. The differences in coverage were ascertained by observation and by chemical estimation of the weight of calcium hydroxide residue on disks of sprayed leaf tissue, sixty disks being taken from each tree. The results showed that spray coverage, and hence control efficacy of insecticidal and fungicidal sprays, are markedly influenced by volume application, which, in its turn, is a function of duration of spraying and volume delivery. The time spent in spraying is a variable factor in practice, chiefly dependent on the size of the tree and to a lesser degree on the personal factor of the operators, but for practical purposes may be defined as the maximum working speed, and volume delivery becomes the significant factor determining volume application. As indicated by the test results, the optimum volume delivery for general orchard spraying is from 3 to 3·5 galls. per minute, but for large trees it could be raised to 4 to 4·5 galls. with advantage.

Further experiments showed that spray coverage is also largely influenced by the conditions under which the spray is applied and by the nature of the surface sprayed. An improvement in cover for smooth surfaces (e.g., most apples) may be obtained by the use of a nozzle or combination of nozzles forming fine droplets of spray and by applying the spray under high pressure (250 to 300 lb.) with the nozzle held sufficiently distant from the fruit to avoid removal of the spray by the blowing effect of high pressure. These conditions also give the best results on 'waxy' surfaces (most plum fruits), but even in the most favourable circumstances the coverage of such surfaces is often poor. The 'hairy' type of surface (peaches) can be covered with a continuous film provided the spray is applied with sufficient force to penetrate between and wet the hairs.

DIEFFENBACH (E. M.). **Corrosion tests of metals and alloys in spray mixtures.**—*Agric. Engng, St Joseph, Mich.*, xviii, 7, pp. 301–302, 1 fig., 1 graph, 1937.

The writer's tests, carried out under conditions approximating as closely as possible to those of actual service, showed that aluminium, either 99 per cent. pure or containing 4 per cent. copper, is very resistant to the corrosive action of lime-sulphur solution (1 in 50) and completely so to that of Bordeaux mixture (3–4–50). Brass and bronze with a copper content up to 85 per cent. showed fair resistance to both preparations. Pure copper and copper alloys were entirely unaffected by Bordeaux mixture and an alloy consisting of 74 per cent. copper, 20 per cent. nickel, and 6 per cent. zinc was also resistant to lime-sulphur; the latter, however, damaged pure copper. Three samples of nickel and nickel alloys and 'stainless' iron and steel [*R.A.M.*, xvi, p. 397] containing 16 to 20 per cent. chromium and 7 to 10 per cent. nickel, or 12 to 18 per cent. chromium and no nickel, proved fully resistant to the action of both fungicides. A copper-bearing iron with a copper content of 0·15 per cent. or above was injured by lime-sulphur but not by Bordeaux mixture. Ordinary steel spray gun disks were not resistant to either preparation, pure tin was unaffected by Bordeaux mixture but damaged by lime-sulphur, while the reverse was the case with pure zinc.

CROSIER (W.), PATRICK (S.), & TAYLOR (L.). **Chemical treatments helpful in germination tests of seeds.**—*Phytopathology*, xxvii, 7, pp. 797–800, 1937.

Cereal seed-grain treated with ceresan, new improved ceresan, and sanoseed [*R.A.M.*, xv, pp. 286, 602] has been observed during the last five years at the New York (Geneva) Division of Seed Investigation to be consistently devoid of the common fungal growths due to *Alternaria* sp., *Fusarium* spp., *Helminthosporium* spp., and *Rhizopus nigricans* which are liable to complicate germination tests in untreated material. Similar satisfactory results were obtained by the application of one of these organic mercury compounds to pea, bean, and maize seed to prevent overgrowth by bacteria and profusely developing fungi. The standard treatment now in use in the writers' laboratory for seeds of the above-mentioned categories consists of a mixture of new improved ceresan and French talc (1 : 5), seeds and chemical being usually shaken up together in a stoppered flask or screw-top bottle [ibid., xvi, p. 444].

HERSCHLER (A.). **Methoden zur Prüfung von Pflanzenschutz- und Vorratsschutzmitteln. XXXIV. Ein Schnellverfahren zur Feststellung des Kupfergehaltes von Spritzbrühen.** [Methods of testing plant protectives and food preservatives, XXXIV. A rapid process for the determination of the copper content of spray mixtures.]—*Nachr-Bl. dtsch. PflSchDienst*, xvii, 7, p. 54, 1937.

The following method is recommended for the determination of the copper content of Bordeaux mixture. Ten c.c. of the mixture is placed in a test tube and the precipitate dissolved by concentrated acetic acid; through a burette a 14·5 per cent. potassium ferrocyanide solution

is introduced in sufficient quantity to induce the precipitation of all the dissolved copper in an insoluble cupric ferrocyanide precipitate, on completion of which process a distinct Berlin blue reaction develops in the presence of a drop of ferric chloride. At this stage the percentage of copper sulphate in the mixture will correspond exactly with the number of c.c. of the potassium ferrocyanide solution.

KRAUSHAAR. **Elektro-Gebläse zum Betrieb des Sulfurators.** [Electro-bellows for the operation of the sulfurator.]—*Blumen -u. PflBau ver. Gartenwelt*, xli, 27, p. 308, 1 fig., 1937.

A simple and convenient electric bellows has been devised in a German rose nursery for attachment to the sulfurator apparatus [*R.A.M.*, xv, p. 298], the necessary heat for the working of which is generated in a few minutes with the expenditure of a negligible amount of current. The systematic and uniform application of sulphur by this method is stated to reduce rose rust [*Phragmidium mucronatum*: ibid., xv, p. 801; xvi, pp. 18, 776] to a minimum, both under glass and in the open.

HUS (P.). **Keuring van tuinbouwzaden.** [Selection of horticultural seed.]—*Tijdschr. PlZiekt.*, xliii, 7, pp. 155–167, 1937.

The writer briefly explains the urgent necessity of seed selection to ensure healthy horticultural stands, outlines the events leading to the amalgamation of a number of independent seed-testing establishments with the Dutch General Selection Service, and enumerates some well-known seed-borne diseases, with observations on their etiology, symptoms, and control, against which attention is directed.

GARDNER (H. A.), CORNTHWAITE (C. R.), & HART (L. P.). **Mildew prevention.**—*Circ. nat. Paint Varn. Lacq. Ass. inc., Sci. Sect.*, 526, pp. 46–57, 1937. [Abs. in *Rev. curr. Lit. Paint Col. Varn., 1937*, 56, p. 134, 1937.]

Mercuric chloride was found to be the most effective fungicide for incorporation in paints to prevent mildew and fungal growths [*R.A.M.*, xvi, p. 398]. Non-toxic compounds efficacious for the same purpose were sodium silicofluoride (1:300), anhydrous phthalate (1:150), and copper oxide (1:300), together with certain proprietary materials.

EDSON (H. A.) & WOOD (JESSIE I). **Crop losses from plant diseases in the United States in 1936.**—*Plant Dis. Reptr, Suppl.* 100, pp. 47–79, 1937. [Mimeographed.]

The estimates here presented in tabular form of the losses caused to cereal, vegetable, fruit, and miscellaneous crops by fungal, bacterial, virus, and physiological diseases in the United States during 1936 have been compiled on the usual lines [*R.A.M.*, xvi, p. 198].

GARBOWSKI (L.). **Postępy badań nad chorobami wirusowymi roślin.** [Progress attained in the investigation of virus diseases of plants.] —*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk. Bydgoszczy*, 16, pp. 127–173, 1937.

In this paper the author presents a comprehensive survey of recent

attainments in the investigation of virus diseases of potatoes, tobacco, tomato, bean, cucurbits, onion, and other plants. A separate section is devoted to the work done in regard to the physical, chemical, and immunological reactions of the various viruses. The bibliography appended comprises 61 titles.

YOUNG (H. E.). **Rhizopogon luteolus, a mycorrhizal fungus of Pinus.**—*Forestry*, xi, 1, pp. 30–31, 1 pl., 1937.

The author states that in the experiments briefly described in this paper, mycorrhiza were quickly formed when the roots of sterile seedlings of *Pinus caribaea* and *P. taeda* growing in sterile white sand (2 parts), loam (1 part), and leaf mould (1 part), were inoculated with pure cultures of *Rhizopogon luteolus* [*R.A.M.*, xv, p. 683], fruit bodies of which were found, together with those of *Boletus granulatus* [ibid., xv, p. 596], growing under the same trees of the two *Pinus* species in Queensland. The mycorrhiza spread over the roots from the points of inoculation, and hypogeal sporophores were produced in regions of actively spreading hyphae, but none from the mature brown mycorrhiza; in one instance a sporophore developed on the soil surface, thus completing the full life-cycle of the organism. The fructification lasted on an average five days before breaking down to a slimy, viscid mass. It is considered possible that earthworms and beetle larvae may help in the spread of the spores of *R. luteolus* through the soil.

MEDVEDEVA (Mme S.). **The toxins of Fusarium buharicum Jacz. and Fusarium graminearum Schw.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xv, 8, pp. 503–508, 1937.

The author states that chemical analysis showed that nutrient solutions in which *Fusarium buharicum* and *F. graminearum* [*Gibberella saubinetii*: *R.A.M.*, xv, p. 457; xvi, p. 31] had been separately cultured for two months contained, respectively, 21·74 and 19·73 mgm. ammonia and 8·9 and 8·4 mgm. urea per 100 c.c. of the filtered solution, but neither aldehydes nor organic acids. Further tests [the results of which are tabulated] showed that the wilting effect of the filtered culture solutions on tomato leaves was not affected by boiling, and hence cannot be due to the action of an enzyme. The permeability of the protoplasm of pieces of potato tubers was greatly increased by immersion in the unboiled medium of *G. saubinetii* cultures, while that in the boiled medium remained unchanged. These findings are considered to support Richter's view [ibid., xv, p. 388] that the toxic principle of the culture solutions is thermostable, a hypothesis confirmed also by Elpidina [loc. cit.], who has shown the active agent to be ammonia.

DENNIS (R. W. G.). **The relation of boron to plant growth.**—*Sci. Progr.*, xxxii, 125, pp. 58–69, 1937.

After briefly reviewing and tabulating the recorded symptoms of boron deficiency in the higher plants, the author summarizes the evidence supporting the view that boron is an essential element in the nutrition of vascular plants, surveys the work done on the function of the element in the plant, notes the different sources of the substance, and discusses how a state of boron deficiency in the soil may be brought

about. The diseases for which boron applications have been recommended are listed and there is a bibliography of 56 titles.

BIRKINSHAW (J. H.). **Biochemistry of the lower fungi.**—*Biol. Rev.*, xii, 3, pp. 357–392, 1937.

Recent developments in the study of the biochemistry of the lower fungi are reviewed in considerable detail under the following headings: inorganic constituents of the medium, nitrogen metabolism, sources of carbon, respiration and energy exchange, growth factors, metabolic products, and enzymes [cf. *R.A.M.*, xv, p. 170 *et passim*].

JONES (L. K.) & VINCENT (C. L.). **The susceptibility of Potatoes to the veinbanding virus.**—*J. agric. Res.*, lv, 1, pp. 69–79, 5 figs., 1937.

The results of the investigations discussed in this paper showed that the potato veinbanding virus [*R.A.M.*, xv, p. 738; xvi, p. 703], tentatively classified as potato virus 20 in 'Illustration of proposed system of nomenclature for plant viruses' (mimeographed) submitted in 1936 to the International Committee on description and nomenclature of plant viruses [ibid., xvi, p. 482], spreads very rapidly in the field in the vicinity of Pullman, Washington, as indicated by the fact that the progeny of a single virus-free Early Rose tuber exhibited 100 per cent. infection with the veinbanding virus in the second year of its cultivation in the field in that neighbourhood. Further tests with seedlings developed from crossing and selfing eleven [named] potato varieties and their seedling progenies showed that Katahdin alone transmitted to its progeny resistance to infection with the veinbanding virus. Seedling clones varied markedly from one another in expression of symptoms, from little or no mottling to moderate or strong mottling of the foliage, as well as various degrees of stem and leaf necrosis, but within a given clone the symptoms were uniform. The varieties Chippewa, Green Mountain, and Russet Burbank also showed some resistance to veinbanding, whereas Bliss Triumph, Early Rose, Gold Coin, Irish Cobbler, and Warba were very susceptible. Virus-free Chippewa, Katahdin, and Warba showed dwarfing and extreme necrosis when infected by the veinbanding virus.

OPITZ (K.). **Versuche über den Abbau der Kartoffel auf den Versuchsfeldern Dahlem und Bornim. Versuchsperiode 1933 bis 1936.** [Experiments on Potato degeneration in the Dahlem and Bornim trial fields. Experimental period 1933 to 1936.]—*Landw. Jb.*, lxxxiv, 4, pp. 545–579, 2 graphs, 1937.

The results of the parallel series of experiments on potato degeneration at Berlin-Dahlem and Bornim during the 1933–6 period are fully discussed and tabulated [*R.A.M.*, xvi, p. 52].

Evidence of varietal differences in reaction to degenerative influences was obtained, Feuergold being resistant, Ackersegen and Konsuragis moderately so, Industrie, Rotweissragis, Voran, and Stärkereiche [Starchy] only slightly resistant, and Goldwährung very susceptible. No appreciable or consistent effect on degeneration was exerted by planting at different dates within the customary practical limits, and the beneficial influence of late sowing is attributed to the restricted opportunities

for virus transmission in the resultant stands. In connexion with the radius of infectivity of the virus (almost exclusively streak or Y mosaic [ibid., xvi, p. 771] in these trials), a marked decline of virulence was observed to coincide with the intervals (60–120–180 cm.) between one row of potatoes and the next; in consequence of the prevailing westerly and easterly winds the north and south direction of the test plots appears to promote infection.

Notwithstanding irrefutable evidence as to the decisive rôle of viruses in the etiology of degeneration [ibid., xvi, pp. 401, 486] the writer is satisfied that ecological factors are also of great importance and deserve equal consideration.

KAUSCHE (G. A.). **Über einige Beziehungen zwischen Viruskonzentration und Infektionseffekt bei Viren aus der X-Gruppe der Kartoffelmosaikviren.** [On some correlations between virus concentration and infective action in viruses of the X group of the Potato mosaic viruses.]—*Biol. Zbl.*, lvii, 7–8, pp. 402–431, 3 figs., 4 graphs, 1937.

Particulars are given of a series of experiments to determine the possible effect on the success of infection and course of the disease induced in Samson-Bashi-Bagli tobacco plants by inoculation with E. Köhler's virus mixture H19s+Cs35, highly virulent variants of H19 and C (tortoise-shell) potato mosaic (X group), respectively [*R.A.M.*, xvi, p. 704].

Positive results were given by inoculation with dilutions of the mixture down to 1:327,680, but the symptoms in such cases were abnormal. The extreme alkalinity (P_H 8·8) resulting from the dilution of the expressed juice did not modify the virulence of the virus mixture. In filtration and adsorption experiments with animal charcoal, a glacial acetic acid collodion filter, kaolin, and diatomaceous earth, the total virus content was considerably weakened without any corresponding injury to either of the two components in the form either of elimination or alteration in their respective proportions. Increasing reductions in the virus concentration lead to a decline in the incidence, and ultimately to the disappearance of primary symptoms, which are replaced by secondary manifestations, and at the minimal doses by the final phases of the disease. No strictly quantitative relation between the number of individual lesions and virus concentration could be traced [ibid., xiv, p. 601].

ZIMMERMANN (SARA). **Il metodo delle lastrine di rame per la diagnosi della degenerazione delle Patate (Ricerche sperimentali). Nota I.** [The copper strip method for the diagnosis of Potato degeneration (experimental researches). Note I.]—*Riv. Pat. veg.*, xxvii, 5–6, pp. 161–187, 5 figs., 6 graphs, 1937.

In this investigation on the diagnosis of potato degeneration by the copper strip method [*R.A.M.*, xvi, p. 553] the author estimates the degree of vigour of the tubers by classifying them according to the width of the discoloured zone as 0, +, ++, +++, multiplying the number of crosses by the number of tubers so affected, dividing the number of crosses thus obtained by the number of tubers, and multiplying by 100. It was found that different values for degree of vigour

were obtained when potatoes of the same variety and place of origin were tested on consecutive days, and the type of discoloration was apparently specific for each variety. Tubers from northern countries grown in hot ones showed approximately the same vigour (by these tests) as in their country of origin and the vigour for any given variety from one and the same locality varied with the length of storage before testing. The width of the discoloured area was found to depend on whether or not the tubers had begun to sprout, and both diseased and healthy tubers tested while still growing gave a vigour-index value of zero.

Garbowski (L.). **Proby przeszczepienia chorób wirusowych Ziemniaków.** [Experiments on the transmission of Potato virus diseases.] —*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk. Bydgoszczy*, 16, pp. 5–39, 21 pl. [2 col.], 1937. [French summary.]

A detailed account is given of Polish experiments in the transmission of certain virus diseases of the potato from one variety to another by tuber core grafting, sap inoculation, or grafting, and from potatoes to other Solanaceae by the two last-named methods. When tuber cores of the Favorit variety, affected with either 'crinkle' or 'streak', or both, were grafted on apparently healthy Preussen tubers, the plants raised from the latter developed acute acronecrosis, [*R.A.M.*, xvi, p. 707], a mild form of which was also produced in the variety by grafting the tubers with cores from apparently healthy Favorit plants. Mild acronecrosis was further caused in plants from apparently healthy Alma and Topaz tubers, grafted with cores from Favorit tubers infected with crinkle. When transferred by the same means, streak mosaic [ibid., xvi, p. 486] from Preussen caused symptoms of mild infection in Favorit, Parnassia, and Topaz. Crinkle from Topaz also gave symptoms of mild infection on Parnassia and Alma, but failed to infect Favorit and Preussen. Of all the other Solanaceous plants that were tested *Hyoscyamus niger* was the most susceptible to infection either by sap inoculation or grafting, but potato stem grafts took and grew best on *Datura stramonium*. Inoculations into Virginia and White Burley tobacco or *H. niger* with juices from Minister v. Miquel, Favorit, Topaz, and Ursus plants affected with various types of crinkle produced symptoms, the severity of which was in direct relation to the severity of the disease on their original hosts. Aucuba or yellow mosaic from the variety Juli failed to produce symptoms on any of the other plants tested. When grown in the greenhouse Parnassia plants developed a condition, chiefly characterized by a partial drying up of the leaf veins, and sap inoculations from these plants into *H. niger* or *D. stramonium* produced symptoms typical of a virus infection. Attempts to transmit the diseases from potatoes to tomatoes, *Solanum nigrum*, *S. dulcamara*, *Petunia* sp., as well as to the potato varieties Parnassia, Gloriosa, Wohltmann, Kmieć, and Tytan, for the most part gave negative results.

Garbowski (L.). **Wpływ gleby na rozwój mozaiki smugowatej w doświadczeniu z odmianą Ziemniaków Industria Modrowa.** [Influence of soil on the development of streak mosaic in tests with the Potato variety Modrow's Industrie.]—*Prace Wydz. Chor. Szkodn. Rośl.*

państw. Inst. nauk. Gosp. Wiejsk. Bydgoszczy, 16, pp. 41–69, 4 graphs, 1937. [French summary.]

This is an expanded version of the author's recent report of his investigations on the influence of the soil on the development of streak mosaic in the Modrow's Industrie potato, a full summary of which has already been published in this *Review* [*R.A.M.*, xvi, p. 486].

ORTON (C. R.) & HILL (L. M.). **An undescribed Potato disease in West Virginia.**—*J. agric. Res.*, lv, 2, pp. 153–157, 6 pl. 1937.

An account is given of a disease, of unknown origin and etiology, which was first observed in 1931 on a few scattered potato plants in Preston County, West Virginia, but has since spread steadily until at present it is a limiting factor in potato production in certain districts of that State; it has also been observed in Pennsylvania and Maryland. The first external symptoms consist of a dwarfing, paling, and upward folding of the terminal leaflets, with a purplish discoloration of the margins of the younger leaflets in the Rural potato varieties. Wilting follows rapidly and axillary shoots are sent out but are short-lived; death of the vines usually ensues seven to ten days later. The roots of affected plants have a dull colour, are reduced in size and length, and break easily on pulling. Early infection results in the production of only a few, if any, tubers of marketable size, normal yields being secured only when the plants become infected at about the time of maturity. The vascular region of the stems, stolons, roots, and numerous regions in the stem pith turn brown and a discontinuous, dendritic necrosis is characteristic of the stem end of the tubers. The young terminal leaflets of diseased plants remain stunted, and show a lateral crowding together of the palisade and mesophyll, together with the suppression of intercellular spaces. The chloroplasts are depleted, and lose their starch grains and vacuoles; their membranes disintegrate and diffuse throughout the cell; the nuclei retain their normal shape but stain heavily with safranin. Phloem necrosis of the stem is one of the early microscopic symptoms of the disease and appears first in the basal region. The adjacent parenchyma also becomes necrotic and, to a lesser extent, the xylem and fundamental tissue, the necrotic areas sometimes showing lysigenous cavities. Before the onset of necrosis the starch grains in the storage cells of the tuber migrate towards the nuclei, and undergo gradual dissolution leaving behind hyaline spheres which form a stringy, often granular mass.

MOORE (W. D.). **The relation of rainfall to the development of late blight of Irish Potatoes in the coastal section of South Carolina.**—*Circ. S.C. agric. Exp. Sta.* 57, 8 pp., 1937. [Abs. in *Exp. Sta. Rec.*, lxxvii, 3, p. 350, 1937.]

Potato late blight (*Phytophthora infestans*) is reported to have occurred only five times during the last twenty years in the coastal region of South Carolina. The development of infection does not appear to be materially affected by mean temperature and relative humidity [cf. *R.A.M.*, xv, pp. 45, 555; xvi, p. 629], but seems to bear some relation to the amount and distribution of rainfall during the growing season.

From the rainfall data obtained during the early part of any growing season it is stated to be possible to predict the time and frequency of spray or dust applications against the disease.

LESZCZENKO (P.). **Badanie odporności Ziemniaków na raka Ziemniaczanego.** [Potato tests for resistance to Potato wart disease.]—*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk. Bydgoszczy*, 16, pp. 71–81, 1937. [French summary.]

A tabulated account is given of further tests of potato varieties for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xvi, p. 119], the results of which showed that the following Polish varieties were immune from the disease, namely: Christiansen, Obra, Apolia, Gloria, Mazur, Przebój, Polonia, Odyniec, Rogalki sałatowe, Aal, Sobieszyńskie późne, Stefania z Sobieszyna, Pallas, Perkun, Friso, and Fram. Twenty-two foreign varieties are also listed as resistant.

JONES (W.) & MACLEOD (H. S.). **Armillaria dry rot of Potato tubers in British Columbia.**—*Amer. Potato J.*, xiv, 7, pp. 215–217, 1 fig., 1937.

The dry rot of potato tubers caused by *Armillaria mellea* [*R.A.M.*, ix, p. 331; xiii, pp. 257, 552] was first observed in British Columbia in 1934 on the Netted Gem, Burbank, and Green Mountain varieties. The diseased tubers show hard, brown, roughened, shrunken, corky areas of varying extent, usually shallow but occasionally (in Green Mountains) penetrating to the medulla. Dark brown to black rhizomorphs are generally attached to the affected areas and may be found adhering to the skin at various points. The diseased internal tissues are light brown and interspersed with convoluted, white, brown-edged mycelial plates. Infected tubers are an almost total loss, but so far the incidence of the disease is inconsiderable.

RUSCHMANN (G.). **Hofmist und Edelmistwirkungen.** [Farmyard and fermented manure effects.]—*Landw. Jb.*, lxxxiv, 2, pp. 263–278, 4 figs., 1937.

In a comparative three-year fertilizing experiment at Landsberg-an-der-Warthe, a heavy incidence of potato blackleg (*Bacillus phytophthorus*) [*Erwinia phytophthora*: *R.A.M.*, xvi, p. 708] was induced, especially in sandy soils, by applications of farmyard manure at the rate of 35,800 kg. per hect., whereas fermented manure (30,000 kg. per hect.) caused little or no disease, and infection was also negligible on the control plots and on those treated with synthetic fertilizers. Four months after the application of the manures, the farmyard plots contained very much greater numbers of micro-organisms, especially putrefactive bacteria, than those receiving the fermented product, and a correlation between the presence of these entities in the soil and the occurrence of blackleg is strongly indicated.

LEPIK (E.). **Eine durch Sclerotinia sclerotiorum verursachte Kartoffelinnenfäule.** [An internal rot of the Potato caused by *Sclerotinia sclerotiorum*.]—*Phytopath. Z.*, x, 2, p. 234, 1 fig., 1937.

Hero potatoes in Estonia were attacked during the persistently hot

and dry summer of 1936 by *Sclerotinia sclerotiorum* [*R.A.M.*, xv, p. 781], the agent of a hollow internal rot with no external symptoms. Sclerotia of the fungus developed profusely in December and January. The diseased tissues bore numerous conidiophores and masses of conidia of *Botrytis cinerea*, and *Phytophthora infestans* was also present in abundance in the epidermal layer of the affected tubers but apparently played no appreciable part in the causation of the rot.

Sarejanni (J. A.). **La pourriture du collet des Solanées cultivées et la classification du genre Phytophthora.** [Collar rot of cultivated Solanaceae and the classification of the genus *Phytophthora*.]—*Ann. Inst. phytopath. Benaki, Greece*, ii, 1, pp. 35–52, 1936 [issued 1937].

Collar rot of potato, tobacco, tomato, and chillies [*Capsicum annuum*] caused by species of *Phytophthora* and taking the form of sudden wilt or 'apoplexy' is among the most serious diseases of cultivated crops in Greece. Infection is favoured by the heavy watering necessary under local conditions in summer, and requires, at least for the first three hosts, a prevailing temperature of over 28° C. before it becomes epidemic.

The fungi causing the condition on the hosts mentioned have papillate sporangia measuring, respectively, 39 to 55 by 32 to 45, 22 to 50 by 19 to 34, 22 to 60 by 29 to 46, and 44 to 68 by 32 to 52 μ. The chlamydospores of the first three organisms measure 18 to 30, 19 to 30, and 16 to 60 μ in diameter, respectively, no chlamydospores being found for the chilli organism, which has amphigynous antheridia, and oogonia 20 to 32 μ in diameter. From these measurements the first three organisms would appear to be identical with *P. parasitica*, and the fourth with *P. capsici* [*R.A.M.*, xiv, p. 222; xvi, p. 159]. In this connexion the author critically discusses Leonian's work on the classification of *Phytophthora* [ibid., v, p. 4 *et passim*].

The potato collar rot may destroy over 80 per cent. of the crop in a few days. Infection begins at flowering time, about the beginning of September, if the prevailing temperature is high enough, and becomes arrested if it falls below 25°. The disease is confined to the vicinity of Thebes and Athens, and appears to have been recently introduced from Cyprus. Control consists in using only healthy seed, digging out the affected plants, earthing up, deepening the irrigation channels, and adding copper sulphate to the water.

P. capsici is prevalent throughout Macedonia, where it was first observed in 1933 and where already 70 per cent. of the chilli crop is sometimes affected. Usually the whole plant withers; occasional attacks have been noted on the fruits and in seed-beds.

The tomato disease occurs sporadically near Athens. It causes no important losses except in seed-beds.

Dastur (J. F.). **'Pan-sukh' disease of Rice in the Central Provinces.**—*Agric. Live-Stk India*, vii, 4, pp. 509–511, 1 pl., 1937.

In 1936, Gurmatia rice growing in Nagpur Division, Central Provinces, India, became affected by a physiological disease known as 'pan-sukh', observed some years before on the same variety, Bhata Gurmatia, and, to a less extent, on Lachai rice, in Chhatisgarh. The first symptom is a

drying up of the outer leaves, and if the affected plants are very young there is very little tillering; only a very few, much attenuated leaves are produced, and these scarcely come to a head. If heads are developed, they are light and may not completely emerge from the sheath. The flowers are sterile, but the glumes are of normal shade and colour. When fully grown plants are affected, tillering is practically normal, but the outer leaves dry up prematurely and the heads are light, occasionally failing to emerge completely. The root system is abnormal, showing dead and unbranched coarse roots or water roots, absence of root hairs, and few secondary fine roots.

The disease was experimentally reproduced by allowing field water to stand, whereas in affected fields that were promptly drained and allowed to dry before being watered again the plants recovered. If the disease occurs late in the season soil application of ammonium sulphate (30 to 50 lb. per acre) arrests its progress and permits the plants to head normally.

The disease is distinct from the destructive 'straighthead' disease reported from the United States, with which a condition of rice from the Central Provinces was thought by Shaw to be identical [*R.A.M.*, ii, p. 31].

KALINENKO (V. O.). **Immunity shifts in Kok-saghyz in vitro.**—*Phytopath. Z.*, x, 3, pp. 332–337, 5 figs., 1937.

The latex of *Taraxacum kok-saghyz* is considered to play an important part in the resistance of the plant to disease. This was exemplified in an experiment with 2,000 'plantation roots' from which the leaves were removed before planting in the greenhouse, whereupon regeneration of the leaves diminished the latex in the roots very considerably, with the result that the plants became severely rotted. When the *Fusarium* causing wilt of *T. kok-saghyz* [*R.A.M.*, xvi, p. 406] was cultured on root portions of the host, those from susceptible plants were overcome by the fungus in one or two days and reduced to a slimy mass, whereas those from resistant plants permitted only a very slight development of the organism. The effect of ether on the root pieces was to increase the resistance, whereas exposure to chloroform intensified susceptibility to a marked degree. Heating to 45° C. for 30 minutes destroyed resistance completely, and at this temperature the latex is transformed into threads of rubber. These results are considered to indicate that a detailed study of the latex in relation to disease resistance in *T. kok-saghyz* is required.

SKINNER (C. E.) & DRAVIS (FAITH). **A quantitative determination of chitin-destroying micro-organisms in soil.**—*Ecology*, xviii, 3, pp. 391–397, 1937.

The authors state that by means of the dilution method and using selective inorganic liquid media, to which a strip of chitin was added so that it was partly submerged, they counted a large number of chitin-destroying micro-organisms in 26 soils, ranging from 288 in a dry sand from the banks of the Mississippi river to over 1,000,000 per gm. of soil in a fertile cultivated loam and garden soils. Most of these organisms were true bacteria, less than half were actinomycetes, and only a few

were moulds, including two strains of *Aspergillus*, six of *Mucor*, two of *Penicillium*, one of *Absidia*, four of *Trichoderma*, one of *Fusarium*, and two each of *Gliocladium* and *Thamnidium*. While both the actinomycetes and the moulds destroyed chitin more slowly than the bacteria, among the moulds the Phycomycetes dissolved it particularly rapidly, in contrast to their well-known lack of cellulose-dissolving power; this behaviour may possibly be related to the fact that the fungi parasitic on other fungi and many of those parasitic on insects are Phycomycetes.

PARK (M.). **The seed treatment of Ginger.**—*Trop. Agriculturist*, lxxxix, 1, pp. 3–7, 1937.

In 1934, seed ginger stored at Peradeniya, Ceylon, and found to be superficially infected with *Sclerotium rolfsii* but otherwise apparently sound, was treated by immersion in a 1 in 1,200 solution of mercuric chloride for $1\frac{1}{2}$ hours, (*a*) two months, (*b*) three days before planting. These treatments gave, respectively, 686 and 728 plants, as compared with 470 in the untreated controls, $6\frac{1}{4}$ lb. of seed being used in each lot.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1936.** —*J. S.-E. agric. Coll., Wye*, xl, pp. 27–36, 2 figs., 1937.

In this account of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xv, p. 824 and next abstract] situation in England in 1936, the authors state that although wet weather favoured infection during July and the early part of August, the three routine applications of home-made Bordeaux mixture (10–15–100) [ibid., x, p. 406] in most cases gave a perfectly healthy crop, as the first treatment was applied before the rains set in. Growers who had delayed spraying applied Bordeaux mixture to the cones, but this practice should cease, as the sprayed cones contain an objectionable amount of copper. The total rainfall for August was 0·99 in. below normal and the improvement is considered to have prevented a major disaster to the crop. During the wet weather in July lateral spikes developed in large numbers towards the top of the bine and their removal was found to be easily effected by a single movement of a sharp knife fastened to the end of a long, light pole. In future, in order to safeguard the crop in very wet weather, spraying should be effected (1) when most of the bines have reached the top wire, (2) when the 'pin' just begins to show, (3) when the burr begins to appear, and (4) immediately the burr has disappeared. Cotton-seed oil Bordeaux emulsion (5 lb. copper sulphate, $7\frac{1}{2}$ lb. hydrated lime, 6 pints edible cotton-seed oil, and 100 galls. water) is recommended for the first three applications, the advantages attaching to this preparation being that heavy applications can be made without fear of injury to the hops, and that nicotine can safely be added to it.

Marked resistance to infection was shown by some of the New Varieties of hops raised at Wye, including Fillpocket (Z 62) and Early Promise (X 35).

SALMON (E. S.). **'Early Promise', a new variety of Hop.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 37–43, 2 figs., 1 graph, 1937.

A full description is given of the hop X 35, which is placed on the market under the name Early Promise. It is liable to only slight attacks

of downy mildew [*Pseudoperonospora humuli*: see preceding abstract] on the bine, and is resistant on the burr and cones. It is capable of carrying mosaic [*R.A.M.*, xv, pp. 424, 605] without showing symptoms, and appears to be immune from nettlehead [ibid., xvi, p. 367].

HAMPP (H.). & JEHL (J.). **Zwei neue Methoden zur Prüfung der pilztötenden Wirkung der Hopfenperonospora-Bekämpfungsmittel.** [Two new methods of testing the fungicidal action of the Hop *Peronospora* control preparations.]—*Phytopath. Z.*, x, 2, pp. 223–229, 1937.

Two laboratory methods are described for testing the fungicidal action of preparations for the control of hop *Peronospora* [*Pseudoperonospora humuli*: *R.A.M.*, xvi, p. 773]. Conidia from severely infected young seedlings in the greenhouse were washed off with rain water and placed in a dish in the laboratory at 18° C., with the result that zoospores were produced in two hours. Leaves taken from plants in experimental plots sprayed with ten different fungicides were transferred to Petri dishes on damp filter paper in the laboratory, and drops of the zoospore suspension placed upon them. The examination of the suspension on a slide after 30, 45, and 60 minutes revealed marked differences in the toxicity of the fungicides to the zoospores, as gauged by the motility of the latter. The resistance of the fungicides to washing off by rain was estimated from determinations made after heavy rains. The relative efficacy of the ten preparations [which are designated only by numbers] is shown in tabular form.

Young shoots of the highly susceptible Hallertau variety were placed in wooden frames in sand with a subsoil of compost in a cold greenhouse at 60 to 80 per cent. relative humidity on 25th May, sprayed with the ten above-mentioned fungicides on 25th and 30th May, 5th, 13th, 20th, and 27th June, and 6th and 15th July, and artificially inoculated with a zoospore suspension of the fungus on 30th June and 1st and 2nd July. On 10th July the plants were transferred to the open, and outbreaks of downy mildew were observed on the 10th, 13th, and 17th. The efficacy of the preparations was rated according to the usual conventional scales.

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GÖPP (K.), CHRIST (R.), & REICH (R.). **Occurrence of micro-organisms in Hops of various qualities.**—*Tagesztg Brau.*, xxxv, pp. 495–496, 1937. [Abs. in *J. Inst. Brew.*, N.S., xxxiv, 10, p. 432, 1937.]

Following up the work of A. H. Burgess [*R.A.M.*, xv, p. 315], the writers tested six samples of hops [? in Germany], of which two were normal while the remainder showed more or less extensive mould growth accompanied by a noticeable impairment of aroma. Among the organisms isolated from the diseased material were *Rhizopus nigricans*, *Penicillium glaucum*, *P. brevicaule* [*Scopulariopsis brevicaulis*], *Aspergillus glaucus*, *Citromyces pfefferianus*, *Cladosporium herbarum*, and a species of *Dematium*. From the results of a series of experiments involving the addition of the infected hop extracts to sterile beer prior to fermentation, the deleterious effects of the moulds in question would

appear to be inconsiderable, being largely nullified by the brewing operations and the simultaneous presence of other micro-organisms.

SALGUES (R.). **Les modifications biochimiques en phytopathologie.** [Biochemical modifications in phytopathology.]—*Rev. gén. Sci. pur. appl.*, xlviii, 9, pp. 237–244, 1937.

The writer tabulates and discusses the results of his comparative biochemical analyses of healthy plants and those infected by fungal diseases, some of which have appeared from time to time in this *Review*. *Colchicum autumnale* bulbs attacked by *Urocystis* [*Tuburcinia*] *colchici* [*R.A.M.*, xvi, p. 777] contained only 0·044 per cent. colchicin as against 0·115 in those of healthy plants. *Peronospora hyoscyami* [ibid., xvi, p. 65] caused a reduction in the total alkaloid content of *Hyoscyamus niger* from 0·208 to 0·054 per cent. The total menthol content of *Mentha piperita* leaves parasitized by *Phyllosticta menthae* was 37·2 per cent. compared with 44·0 in those of healthy plants. The carbohydrate content of Early Rose potato tubers infected by *Synchytrium endobioticum* amounted to only 15·30 per cent. as against 24·98 for sound ones. Comparable data are furnished for a number of other drug plants, fodders, meadow grasses, and miscellaneous plants.

VARADARAJA IYENGAR (A. V.). **Contributions to the study of spike disease of Sandal (Santalum album Linn.). Part XVII. Some factors relating to the abnormal accumulation of carbohydrates in diseased tissues.**—*J. Indian Inst. Sci.*, xx A, 1, pp. 1–14, 1937.

Spiked sandal (*Santalum album*) leaves [*R.A.M.*, xvi, p. 340] from Bangalore and other localities gave proof of higher diastatic activity than healthy ones at all temperatures tested (25° to 27°, 45° and 50° C.), as well as after the elimination of tannin by means of ethyl acetate. Though the total quantity of material extracted from spiked specimens is less than that from the controls, the actual tannin content of diseased foliage is more than twice that of healthy leaves. The extract from affected samples was further found to enhance the amylase activity of both sound and diseased detannized residues, while a similar extract from healthy material exerted a comparatively feeble stimulus. In spiked leaves the tannins were found to consist largely of the pyrogallol group, whereas those of healthy ones belonged principally to the pyrocatechin category. Pyrogallol accelerated amylase activity in both leaf types, whether detannized or not, but pyrocatechin tended to inhibit the diseased specimens more than the controls. The high diastatic activity of spiked leaves results in the synthesis of more starch from the sugars present therein. Although starch accumulation is noticeable from the inception of the disease, sugar concentration increases only in the advanced stages parallel with the decomposition of fatty substances. The total fat content of diseased leaves is appreciably lower and the free acidity of ether extracts higher than in the controls. Evidence is adduced to show that starch accumulation commences from below and is therefore due to defective translocation. Inability to assimilate calcium is the immediate reaction of the sandal stems and leaves to spike infection.

SAREJANNI (J. A.). **Liste II des maladies des plantes cultivées et autres de la Grèce.** [List II of diseases of cultivated and other plants in Greece.]—*Ann. Inst. phytopath. Benaki, Greece*, ii, 1, pp. 8–12, 1936 [issued 1937].

This second list of diseases of plants in Greece [*R.A.M.*, xv, p. 556] is based on material examined at the Benaki Phytopathological Institute during 1934–5.

TSCHUDY (R. H.). **Experimental morphology of some species of Chaetomium. I. Use of cultural reactions in determining species characteristics.**—*Amer. J. Bot.*, xxiv, 7, pp. 472–480, 15 figs., 1937.

From a study [details of which are given] of nine species of *Chaetomium* cultured for several generations on over 75 different nutrient media, the author concludes that cultural reactions of these fungi appear to be the best means of arriving at an accurate determination of their specific characteristics, and he believes that in this genus descriptions will have little value unless a definite substratum, e.g., malt-dextrose-starch is used for the growth of the species. As a result of his studies he describes the cultural behaviour of a number of species of *Chaetomium*, reduces *C. affine* to a variety, var. *affine*, of *C. globosum*, states that *C. subterraneum* [*R.A.M.*, ix, p. 58] is nothing but *C. globosum*, and erects two new species.

HANSFORD (C. G.). **Annotated host list of Uganda parasitic fungi and plant diseases. Part II. Part III.**—*E. Afr. agric. J.*, ii, 6, pp. 498–504; iii, 1, pp. 79–84, 1937.

These two further instalments of the author's list of parasitic fungi and plant diseases so far recorded in Uganda are on the same lines as the first [*R.A.M.*, xvi, p. 550], and include hosts belonging to 37 families.

Armillaria mellea is stated to cause the most important disease of tea in Uganda [ibid., viii, p. 202]. Cotton wilt (*Verticillium albo-atrum*) [ibid., xv, p. 150; xvi, p. 455] is now known from most cotton areas south of Lakes Albert and Kioga and is increasing every year. The fungus is distributed all over Uganda in seed obtained from diseased plants, and under present conditions dissemination by this means cannot be prevented. It is probable that *V. albo-atrum* is locally the chief cause of cotton wilt. The fungus was recently discovered attacking cassava at Bukalasa. *Mycosphaerella areola*, the ascigerous stage of *Cercosporella gossypii* (syn. *Ramularia areola*) [ibid., xiv, p. 629] was recorded in its ascigerous stage on cotton. *Gibberella fujikuroi*, a common saprophyte on dead cotton plants, causes a disease of cotton seedlings simulating sore shin. *Cladosporium album* [*Erostrotheca multiformis*: ibid., xvi, p. 322] is recorded on beans (*Phaseolus*) (on which it causes little damage) and peas.

MANEVAL (W. E.). **A list of Missouri fungi with special reference to plant pathogens and wood-destroying fungi.**—*Univ. Mo. Stud.*, xii, 3, pp. 1–150, 1937.

In continuation of the author's earlier compilation [*R.A.M.*, vi, p. 126], an alphabetical list is given of 1,191 Missouri fungi, including

chiefly plant pathogens and wood-destroying organisms, but mentioning also a few saprophytes and diseases of virus or physiological origin, based on a study of additions made to the Missouri herbarium since the publication of the earlier list and a careful perusal of the literature of the subject. The list is followed by a host index and a bibliography of 526 titles.

YARWOOD (C. E.). **Unreported powdery mildews.**—*Plant Dis. Reptr*, xxi, 10, pp. 180–182, 1 fig., 1937. [Mimeographed.]

A list is given of 31 hosts on which powdery mildews, believed to be new to the United States, were found in California since 1934. The fungi are grouped, in the absence of perithecia, according to their conidiophores, of which three types are distinguished, viz., the *Erysiphe polygoni* type, the *E. cichoracearum* type, and the *Podosphaera leucotricha* type. All specimens with conidiophores of *E. polygoni* type showed clear evidence of a diurnal cycle of conidial formation and division of the generative cell [*R.A.M.*, xvi, p. 627].

SYDOW (H.). **Novae fungorum species—XXV.** [New species of fungi—XXV.]—*Ann. mycol., Berl.*, xxxv, 3–4, pp. 244–286, 1937.

In this critically annotated list 42 new species and 4 new genera of fungi, with Latin and German diagnoses, are described from various parts of the world [*R.A.M.*, xvi, p. 342]. *Maravalia crotalariae* n.sp. formed a yellowish-white, mealy coating of uredosori on the stems and inflorescences of *Crotalaria usaramoensis* from Malaya, with spherical, subspherical, or very broadly ovate, echinulate-verruculose uredospores, 16 to 21 by 14 to 17 μ, with a hyaline membrane barely 1 μ in thickness; the teleutosori occur on the stems and on dry, brownish spots 0·5 to 1·5 mm. in diameter on the leaves and bear ellipsoid, oblong to ovate, or broadly fusiform, smooth teleutospores, 23 to 32 by 9 to 15 μ, with a hyaline membrane 0·5 to 0·7 μ in thickness, arising in groups from a hyaline hymenial cell, mostly 8 to 12 by 5 to 8 μ, forming a quadricellular promycelium 45 to 65 by 4·5 to 6 μ, and furnished with a hyaline pedicel, 15 to 30 by 2·5 to 4 μ.

PICBAUER (R.). **Fungi bulgarici a Dre F. Bubák lecti.** [Bulgarian fungi collected by Dr. F. Bubák.]—*Ann. mycol., Berl.*, xxxv, 2, pp. 138–148, 1937.

An annotated list is given of 65 fungi collected in Bulgaria by the late Dr. F. Bubák, including 31 new species, 3 new varieties, and one new name, for which Latin diagnoses are supplied. *Hypospila rhodopea* Bub. & Picb. n.sp. was found on *Prunus divaricata* twigs. *Phyllosticta trifoliiseda* n.sp. was collected on *Trifolium* (?) *medium* leaves, and a fungus doubtfully identified as *P. violae* [*R.A.M.*, xv, p. 468] with cylindrical, straight or curved, continuous, light brown conidia, 6 to 11 by 2 μ, on those of *Viola odorata*, producing circular, white spots 2 to 4 mm. in diameter. Ill-defined lesions with brown centres and purplish-pink margins on *Vaccinium uliginosum* were found to be due to *Septoria vaccinii uliginosi* n.sp. *Hendersonia alabakensis* n.sp. was responsible for round, dry spots with dark edges, 5 to 7 mm. in diameter, on elm (*Ulmus effusa*) leaves. Walnut (*Juglans regia*) leaves were infected by

Marssonina juglandis [*Gnomonia leptostyla*: ibid., xv, p. 330]. *Cercosporina bubakii* Picb. n.sp. formed circular to angular, brown, often confluent spots, 2 to 3 mm. in diameter, on both sides of *Ribes petraeum* leaves.

SYDOW (H.), MITTER (J. H.), & TANDON (R. N.). **Fungi indici—III.** [Indian fungi—III.]—*Ann. mycol., Berl.*, xxxv, 3–4, pp. 222–243, 1937.

This copiously annotated list of 72 Indian fungi [*R.A.M.*, xiv, p. 470] contains 18 new species with diagnoses in Latin and German.

TAI (F. L.). **A list of fungi hitherto known from China. Parts II, III, and IV.**—*Sci. Rep. Tsing-Hua Univ.*, Ser. B, ii, 4–6, pp. 191–639, 1937.

Parts II, III, and IV of the writer's profusely annotated list of Chinese fungi [*R.A.M.*, xvi, p. 1], amplified in a number of cases by Latin or English diagnoses, consists of 676 Ascomycetes, 1,077 Basidiomycetes, and 753 Fungi Imperfecti. Host and fungus indexes are appended.

FISCHER (E.). **Über einige von E. Gäumann in Java und Celebes gesammelte Ustilagineen und Uredineen.** [On some Ustilagineae and Uredineae collected by E. Gäumann in Java and Celebes.]—*Ber. schweiz. bot. Ges.*, xlvii, pp. 419–424, 1937.

This is a critically annotated list of two Ustilagineae and twelve Uredineae (the latter including three new species with Latin diagnoses) collected by E. Gäumann in Java and Celebes from 1919 to 1922. *Aecidium mori* was found on mulberry (*Morus indica*) [*R.A.M.*, xii, p. 396] leaves.

BOSE (S. R.). **Polyporaceae from Lokra Hills (Assam).**—*Ann. mycol., Berl.*, xxxv, 2, pp. 119–137, 1937.

This is a fully annotated list of 73 Polyporaceae collected during 1933–4 by N. L. Bor in the Lokra Hills of Assam (5,000 to 10,000 ft. above sea-level), mostly on logs and fallen tree trunks, including certain rare species never encountered in the Bengal plains [*R.A.M.*, xv, p. 469] but common in the temperate climates of Europe and North America.

KOCH (L. H.). **Bacterial diseases of Tobacco in Canada.**—*Lighter* (*Dep. Agric., Can.*), vii, 3, pp. 13–16, 1937. [Mimeographed.]

Angular leaf spot of tobacco (*Bacterium angulatum*) [*R.A.M.*, xvi, p. 637] occurs every year in Ontario and Quebec, usually being worse in the latter than in the former locality. In an epiphytotic in the Assomption district of Quebec in 1935 Parfum d'Italie was the variety most severely attacked, Petite Havane was highly susceptible, but the Belge variety was little affected and, unlike the other two, was resistant to physical injury.

Wildfire (*Bact. tabacum*) [loc. cit. and next abstract], first reported in Canada from Quebec in 1925, has since been recorded at different times from the same locality, north of Montreal, and Ottawa; it is thought that it may also have been present along the northern shore of Lake Erie.

Hollow stalk (*Bacillus* [*Erwinia*] *aroideae*) [ibid., xvi, pp. 658, 780] has occurred sporadically in Ontario and Quebec since the early days of tobacco-growing, but has only been a minor trouble. The identity of hollow stalk with the blackleg reported from Kentucky and attributed to the same organism [ibid., xi, p. 209] is not yet accepted by the author. In 1936, blackleg was widespread in Essex and Kent counties, Ontario, and was sometimes accompanied by damping-off due to *Rhizoctonia* and *Pythium* spp. [ibid., xvi, p. 637].

Control measures for the diseases are briefly indicated. [This paper is republished in *Plant Dis. Reptr*, xxi, 15, pp. 287–289, 1937.]

DUFRÉNOY (J.). **Modifications of cell structure in 'halo wildfire' and 'epidemic wildfire'.**—*Phytopathology*, xxvii, 7, pp. 792–796, 5 figs., 1937.

The examination of tobacco seedlings attacked by the 'halo' form of wildfire (*Bacterium tabacum*) [*R.A.M.*, xv, p. 537] in south-western France in 1931, 1932, 1936, and 1937 showed, as already pointed out by the writer, that the resultant pathological modifications depend on the relative humidity of the atmosphere and the relative intensity of sunlight [ibid., xii, p. 476]. When the sky was overcast and relative humidity ranged from 80 to 100 per cent. at the time of infection the affected cells retained their turgescence, though undergoing a loss of starch and sugars; the translocation of the former from the plastids was accompanied by the development of oil droplets that adsorbed the yellow carotin pigments. When the sky was clear and relative humidity below 80 per cent., the vacuolar solution became rich in phenolic compounds and tetrahedric crystals of calcium oxalate, while the hydrogen-ion concentration rose above P_H5. In 'halo' formation the bacteria are unable to invade and destroy rapidly the adjacent cells, giving the toxin time to diffuse out, whereas in 'epidemic' wildfire they quickly invade the tissues, owing to water-soaking, and involve the destruction of the adjacent areas. Tobacco leaves subjected to a strong water spray for two minutes develop water-soaked areas that may develop into 'experimental wildfire lesions' on inoculation with a suspension of *Bact. tabacum*. After a few hours of strong insolation the water-soaked infected tissue may dry out and darken into typical wildfire lesions.

Report of Committee of the Tobacco Research Council on the black-shank disease of Tobacco.—*Plant Dis. Reptr*, xxi, 13, pp. 246–248, 1937. [Mimeographed.]

This is a concise summary of the available information [much of which has already been presented here from other sources] concerning the distribution and importance, host range, environmental relations, modes of dissemination, and prevention or control of black shank of tobacco (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, xvi, p. 780] in the United States [ibid., xiv, p. 608]. In 1935 the disease was newly reported from two States, Tennessee and Kentucky. The only reliable method of control in the cigar-wrapper area of Florida and Georgia consists in the planting of resistant varieties, seed of which is obtainable from the North Florida Experiment Station, Quincy. In

North Carolina, four- to five-year rotations, interspersing small grains, clover or *Lespedeza*, and maize between the tobacco crops, are stated to have given almost complete control.

SPENCER (E. L.). **Influence of host nutrition on systemic development of Tobacco mosaic.**—*Plant Physiol.*, xii, 3, pp. 825–832, 1937.

In continuation of his previous investigations [*R.A.M.*, xiv, pp. 474, 659], the author has studied the effect of mineral nutrition on the systemic spread of yellow tobacco mosaic (Johnson's virus No. 6) in tobacco plants in sand cultures, the time required for the virus to reach and produce symptoms on the tip leaves of inoculated plants being determined. The results showed that in tobacco plants supplied with nutrient solutions containing either a deficiency or an excess of nitrogen, symptoms of systemic infection on the apical leaves of inoculated plants appeared earlier than in plants that received a medium amount of nitrogen, sufficient to produce healthy, vigorous growth. The time at which treatment with excess nitrogen was started before inoculation did not appear to affect the results. The systemic infection symptoms developed earlier in plants that received no phosphorus, than in those treated with excess phosphorus, the retardation increasing progressively in plants treated with excess phosphorus for one, two, three, or four weeks prior to inoculation; the growth of the plants was also directly correlated with the duration of the excess phosphorus treatment. A similar correlation was also found between the time of appearance of the systemic symptoms and the duration of treatment with excess potassium, but excess potassium retarded the growth of the plants more than potassium deficiency. These results are considered to indicate that the development of yellow mosaic was accelerated by high nitrogen nutrition and retarded by either high phosphorus or high potassium nutrition. No correlation was apparent between the rapidity with which the systemic symptoms developed and the distance the virus had to travel to reach the growing tip.

DOOLITTLE (S. P.) & BEECHER (F. S.). **Seed transmission of Tomato mosaic following the planting of freshly extracted seed.**—*Phytopathology*, xxvii, 7, pp. 800–801, 1937.

Shortly after transplanting, 13 out of 257 plants, raised at the Arlington Experiment Station, Virginia, from seed sown immediately after extraction from tomato fruits harvested in the field in 1934, developed mosaic. Seed transmission of the disease being suspected, fresh lots of seed were extracted from greenhouse tomatoes affected by (*a*) ordinary mosaic (tobacco virus 1), and (*b*) streak caused by tobacco mosaic combined with potato virus X [*R.A.M.*, xvi, p. 571] and sown in pots under controlled conditions, one lot being previously washed and dried for a week and the other planted immediately. In the washed series, 6 plants out of 249 raised from mosaic seed and 4 out of 136 from the seed of streaked plants were stunted and bore twisted, filiform cotyledons, while in the untreated, identical symptoms were observed in 8 out of 257 plants in the mosaic lot and in 7 out of 104 in that of streaked origin. Subsequently this cotyledonary deformity developed into typical mosaic but at no time did any symptoms of

streak appear. The 523 controls raised from seed from mosaic-free tomatoes remained healthy. Out of 3,567 plants raised from seed from mosaic or streaked plants stored for 3 to 12 months before planting, none showed infection in the seedling stage but 19 contracted mosaic after the formation of four to six leaves, though here again streak was absent; the 937 controls remained healthy. While transmission by stored seed therefore is not definitely established, the practice of sowing tomato seed immediately after extraction in order to produce several generations of plants in close succession would appear, from these data, to entail considerable risk of mosaic transmission.

BALD (J. G.). **Investigations on 'spotted wilt' of Tomatoes. III. Infection in field plots.**—*Bull. Coun. sci. industr. Res. Aust.* 106, 32 pp., 4 graphs, 1 diag., 1937.

In this, the third paper of this series [*R.A.M.*, xi, p. 549], the author gives a detailed account of his study of the data accumulated from 1926 to 1934, inclusive, at the Waite Agricultural Institute on the infection of tomatoes with spotted wilt [cf. ibid., xvi, pp. 517, 571], and recorded in the form of field maps showing the position of each diseased plant and the date on which the symptoms were observed. The curve for infection rates, constructed for the whole period under review, showed a series of maxima probably representing the emergence of successive generations of adult thrips (*Thrips tabaci* and *Frankliniella insularis*) vectors of the virus. High daily rates of infection appeared to be related to high temperatures occurring twelve days earlier, and low rates to low temperatures, but there was a slight indication that current high temperatures depressed the infection rate. In a rapidly growing tomato plant the normal incubation period appeared to be twelve days, but was longer and more irregular in mature plants, and sometimes was shorter in very young vigorous plants. In summer weather all the plants within a radius of 10 to 15 yds. from an infection focus were equally liable to be infected, the likelihood of infection decreasing with increasing distance. Statistical studies [loc. cit.] showed that field transmission of the disease was almost entirely by insects. Irregularities in the distribution of diseased plants were associated with differences in varietal susceptibility, the presence of thrips on adjacent ornamentals, differences in methods of watering, and perhaps to local patchiness of the soil affecting the palatability of the plants to the vectors. Varietal differences in susceptibility, due to the internal resistance of plants to the multiplication and translocation of the virus, were smallest when the inoculated plants were very small and growing rapidly, and greatest when the plants were fruiting. The failure of spraying and dusting to control the disease is explicable in a large measure by the invasion of the treated plots by infective vectors from outside.

FOSTER (A. C.) & TATMAN (E. C.). **Environmental conditions influencing the development of Tomato pockets or puffs.**—*Science*, N.S., lxxxvi, 2218, pp. 21–22, 1937.

Tomatoes in the Atlantic and Gulf Coast States, California, and northern greenhouses are liable to serious damage from a disease known

as 'pockets' or 'puffs', the losses from which in the early spring crops of Texas commonly amount to 15 per cent. and may reach 65 per cent. Contributory factors to the development of the disorder were shown by intensive studies during the past five years to include non-fertilization of the ovules or typical parthenocarpy, associated with abnormalities of the reproductive organs, ovule or embryo abortion after normal fertilization, and necrosis of the vascular and placental tissue after the fruit is well developed, due to excessively high or low temperatures, soil saturation or supersaturation, low soil moisture, and other conditions impeding proper growth through disturbances in the metabolic and respiratory activities. There is some evidence that the incidence of 'pockets' may be reduced by plentiful applications of superphosphate and a sparing use of nitrogen.

[A more detailed account of this work is given by the authors under the same title in *Plant Physiol.*, xii, 3, pp. 875–880, 1937.]

Krausche (K. K.) & Gilbert (B. E.). **Increase of transpiration rates of Tomato leaves due to copper sprays.**—*Plant Physiol.*, xii, 3, pp. 853–860, 1937.

The results of greenhouse experiments briefly described in this paper, in agreement with those of Wilson and Runnels [*R.A.M.*, xii, p. 459; xvi, p. 714] and some other investigators, showed that spraying with Bordeaux or Burgundy mixtures increased the total transpiration of tomato plants for the 24-hour period from a low percentage to a maximum of 105, the greatest effect occurring at night, and that independently of whether the spray was applied to the upper, to the lower, or to both surfaces of the leaves. The greatest increase in transpiration was further shown to be effected by those sprays which were very likely to cause injury to the leaves. A series of direct observations of the effect of the sprays on the stomata, made with a Leitz ultrapak at three- to six-hour intervals for more than 24 hours, indicated that the general appearance of the stomata of tomato leaves sprayed with 8–8–50 Bordeaux mixture did not differ from that of the stomata of control leaves, except that some of the stomatal pores of the former seemed to be clogged or sealed by minute particles of dried spray material. Transpiration in the tomato must take place largely through the cuticle, and microchemical tests showed that the epidermis of the tomato plants used in the experiments was composed of undifferentiated cellulose, which is permeable. The authors suggest that the soluble copper and calcium on the leaf surface probably readily penetrate through the epidermis, and bring about changes in the permeability of the membranes of the guard and mesophyll cells, so that water loss takes place at varying rates.

Wollenweber (H. W.). **Zur Abwehr des Ulmensterbens.** [On the prevention of the dying-off of Elms.]—*Forsch. dtsch. Fortschr. Wiss.*, xiii, 20–21, pp. 251–252, 2 figs., 1937.

Following a brief explanatory account of the connexion between bark beetles [chiefly *Scolytus scolytus* and *S. multistriatus*] and the elm disease (*Ceratostomella*) [*ulmi*], the writer refers to the promising results of grafting experiments in Italy with *Ulmus pumila* and *U. pinnato-*

ramosa, and in Holland with the Spanish seedling *U. foliacea* No. 24 [*R.A.M.*, xvi, p. 643]. Grafting experiments at Dahlem, Berlin, with *U. pumila* and *U. pinnato-ramosa* on susceptible but healthy individuals of the species commonly used for street planting gave somewhat disappointing results, since the small-leaved and squarrose habit of the dwarf oriental varieties prevents the crowns from affording adequate shade. It has been shown, however, that *C. ulmi* is incapable of infecting either the immune scion or the susceptible stock of such grafts, presumably owing to the avoidance of healthy wood and abundant sap by the bark beetles, which prefer to breed in sickly tissues.

PEGLION (V.). **Produzione e commercio delle Castagne.** [Chestnut production and industry.]—*Ital. agric.*, lxxiv, 7, pp. 479–487, 1937.

In connexion with a statistical survey of the Italian chestnut industry, the writer mentions a decline in production amounting to about 1,000,000 quintals between 1910 and 1934 as a result of the ink disease [*Phytophthora cambivora*: *R.A.M.*, xv, p. 617 and next abstract].

PETRI (L.). **La difese fitosanitaria e la ricostituzione dei Castagneti.** [The phytosanitary defence and the reconstitution of Chestnut groves.]—*Ital. agric.*, lxxiv, 7, pp. 489–494, 3 figs., 1937.

A summary is given of the available information on the ink disease of chestnuts (*Phytophthora cambivora*) [see preceding abstract] and the work in progress in Italy on its control by preventive, curative, and legislative measures, and more especially by the gradual extension of the Japanese *Castanea crenata*, of which 2,575 were planted in experimental sites between 1925 and 1933. Other fungal parasites of the chestnut are of no great economic importance; the spread of *Coryneum perniciosum* [*C. modonium*, the conidial stage of *Melanconis modonia*: *R.A.M.*, vi, p. 6] may be prevented by the excision and burning of diseased branches before the spores have time to mature.

DÉFAGO (G.). **Cryptodiaporthe castanea (Tul.) Wehmeyer, parasite du Châtaignier.** [*Cryptodiaporthe castanea* (Tul.) Wehmeyer, a parasite of the Chestnut.]—*Phytopath. Z.*, x, 2, pp. 168–177, 6 figs., 1937.

Cryptodiaporthe castanea (the ascigerous stage of *Fusicoccum castaneum*) [*R.A.M.*, vi, p. 5] was responsible for extensive mortality among young chestnuts of an improved Ticino variety in a planting in Valais, Switzerland. The fungus developed in the cortex and produced sunken cankers that gradually encircled the stem and caused its sudden collapse. The perithecial stage agrees in the main with the description of Wehmeyer [ibid., xiii, p. 270]. The pycnidia arise from locules in a greenish-grey ectostroma composed of parallel hyphae arranged perpendicularly to the stem axis and the hyaline, oval to elongated pycnospores are borne on short, simple, fusoid sterigmata dotted over the inner surface of the locules and measure 4 to 9 by 1·5 to 3·5 μ (mean 6·6$\pm$0·75 by 2·3$\pm$0·44 μ) on the host. Under very humid conditions the entire black, coriaceous paraplectenchyma ruptures, and exposes the gelatinous sporogenous layers.

Both pycnospores and ascospores germinate rapidly in culture and produce a chestnut-brown mycelium consisting of hyphae, 3 to 4 μ in

diameter, and ovoid pycnidia with a coating of greyish hyphae, a brown, irregular, apical ostiole, a central prosenchyma extending towards the base, and a black peripheral paraplectenchyma as in nature. Locules occupy the entire centre of the pycnidium and produce spores slightly more elongated and less regular than those occurring on the host. On an inclined slope culture *C. castanea* assumes an exceptional habit of growth: the production of aerial hyphae suddenly ceases, whereas the submerged mycelium continues to grow and forms fresh aerial hyphae 5 to 8 mm. lower down, so that the slope appears to be intersected by transverse bands. This remarkable property, which is apparently independent of light and temperature, is gradually lost.

Inoculation experiments with pycno- and ascospore cultures of the fungus on hazel-nut (*Corylus avellana*) and chestnut gave positive results on the latter only (28 out of 30). The host is actively penetrated, probably through a wound or dead bud. However, on vigorous stems the cankers only grow in a longitudinal direction and many are completely arrested by callus formation unless adverse factors supervene to weaken the natural resistance of the host. Control should consist in the avoidance of unfavourable environmental conditions, careful selection and preparation of the soil, and the removal of infected stems at least 15 cm. below the canker.

WALLACE (G. B.). **Notes on the susceptibility of indigenous trees to Armillaria.**—*E. Afr. agric. J.*, III, 1, pp. 49–51, 1937.

An annotated list is given of 21 forest trees in the Usambara Mountains, Tanganyika Territory, whose dead roots after felling showed infection by *Armillaria* [*mellea*: *R.A.M.*, xv, p. 746; xvi, p. 564], the native and botanical names of the hosts being given. The fungus has been found attacking only a few living trees, namely, *Trema guinensis*, *Chlorophora excelsa*, and a species of *Acacia* in Tanganyika and *Bauhinia* sp., *Erythrina* sp., and *Ficus* sp. in Uganda. *Ocotea usambarensis* appears to be resistant, many roots up to 20 years old having been found free from infection.

SAREJANNI (J. A.). **Un parasite nouveau du Caroubier.** [A new parasite of the Carob tree.]—*Ann. Inst. phytopath. Benaki, Greece*, ii, 1, pp. 53–56, 2 pl., 1936 [issued 1937].

Young pods of *Ceratonia siliqua* growing in Crete and atrophied or deformed as a result of infestation by the Cecidomyid *Eumarchalia gennadii* Marchal showed the presence in close proximity to the insect punctures of immersed, later erumpent, globose-depressed, black, ostiolate pycnidia, 150 to 300 μ in diameter, either densely crowded or else sparsely present on a hard, round, raised, circular, necrotic lesion. The pycnidial walls bore numerous filiform, hyaline sterigmata 21 to 25 μ long, bearing at the extremity a straight, ovoid, later ellipsoid or fusiform, subsequently subcylindrical spore measuring 9 to 17 by 4·5 to 7 μ when unicellular, and 16 to 20 by 5 to 6 μ when bicellular (10 to 25 by 6·7 μ and 25 to 30 by 5·5 to 7 μ, respectively, in culture), usually hyaline, but occasionally a very light, scarcely perceptible yellow. Though showing some resemblances to *Diplodina*, the author regards the fungus as a new species of *Diplosclerophoma* and names it *D.*

(*Diplodina*) *ceratoniae* n.sp., with a Latin diagnosis. It is apparently a wound parasite.

CHRISTENSEN (C. M.). **Cephalosporium canker of Balsam Fir.**—*Phytopathology*, xxvii, 7, pp. 788–791, 2 figs., 1937.

Balsam firs (*Abies balsamea*) in Minnesota and Wisconsin are liable to infection by a species of *Cephalosporium* causing the development on the cortex of oval or elliptical, slightly sunken cankers, commonly but not invariably originating at branch stubs and exuding resin from broken blisters. A brown discoloration of the underlying bark may extend into the wood through one or two annual rings and sometimes covers a larger area in the wood than in the bark, probably indicating a more rapid progress of the fungus in the former region. None of the cankers observed were apparently more than three or four years old and they occur most frequently on suppressed trees 3 to 5 in. in diameter. In an inoculation experiment on three healthy *A. balsamea* trees with the organism isolated from such cankers the spread of infection was unusually rapid, one canker attaining a length of 12 in. in a year and extending about a quarter of the way round a 5-in. tree, while the smallest tree, 3 in. in diameter, was practically girdled by two cankers.

On malt agar at 20° to 30° C., the colonies of the fungus are faintly zonate, and the mycelium white and flocculent. The minimum, optimum, and maximum growth temperatures appear to be 0°, 27° to 30°, and 35°, respectively. The elongate-oval conidia, sometimes pointed at the base or unilaterally flattened, measure 2·8 to 5·7 μ in length and are produced in 'heads' of 5 to 20 (average 7 to 10), either on short sterigmata or directly on simple or uni- to quadriverticillate conidiophores, 10 to 90 μ in length (average 20 to 40 μ). There is insufficient evidence to identify the species under observation with *C. album*, described by Saccardo as occurring on dead pine branches, and the former may possibly be new to science.

RUBNER (K.). **Schüttebefall an Kiefern verschiedener Herkunft.** [Needle fall on Pines of diverse origin].—*Tharandt. forstl. Jb.*, lxxxviii, 4, pp. 289–293, 3 graphs, 1937.

In 1934, Carpathian (pre-war Hungarian) pine seedlings in an experimental planting at Tharandt, Saxony, showed 90 per cent. infection by needle fall [*Lophodermium pinastri*: *R.A.M.*, xii, p. 604], the corresponding figures for those from a German moorland, Upper Franconia, Tharandt, and the Black Forest being 6, 24, 51, and 80 per cent., respectively. In the following year the condition of the trees began to improve and by 1936 it was possible to estimate the position as regards the health of the survivors. Of the Upper Franconian seedlings about 90 per cent. were sound, followed by those of moorland and local origin (*c.* 63 per cent. healthy), while only about 36 per cent. of the Carpathian and Black Forest pines were fit to be retained, the former being even more sickly than the latter. The resistance of the Upper Franconian material to *L. pinastri* is particularly gratifying in view of its adaptability to the conditions obtaining in high elevations in Saxony.

LIUBARSKI (L. V.). Сосновая губка **(Trametes pini Fr.)** в ДВК. [The Pine fungus (*Trametes pini* Fr.) in the Far East.]—*Bull. Far Eastern Br. Acad. Sci. U.S.S.R., 1936*, 21, pp. 113–123, 3 diags., 2 graphs, 1936. [English summary. Received October, 1937.]

Trametes [*Fomes*] *pini* [*R.A.M.*, xvi, p. 357] is stated to be one of the most common parasites of conifers over the whole extent of the U.S.S.R.; in the Far East, in particular, it causes widespread and severe decay of the three most important species, namely, *Picea yezoensis* Carr., *Pinus koraiensis*, and *Larix dahurica*, the last-named also being attacked in Saghalien Island. *P. sylvestris* was found to be infected only sporadically, and *P. funebris* is apparently immune.

Field observations and controlled experiments showed that the mycelium of *F. pini* remains active for as long as five years in *P. yezoensis* logs stacked under damp conditions, but that infected wood of this species gives fairly long service in well aerated and dry buildings, where it may be safely used, especially as the physical properties of the wood are not much lowered in the initial stages of the decay caused by this fungus.

Plant importation rules, Malaya, in force from 1936.—Dep. Agric., S.S. & F.M.S., 38 pp., [1937.]

This is a collection of leaflets showing the plant importation rules in force since 1936 in the Federated Malay States, Straits Settlements, Johore, Kedah, Kelantan, Trengganu, and Perlis. Under the Plant Importation Rules, 1936, Gazette Notification No. 1485 of 29th May, 1936, the importation into Malaya (except from a Malay State) of the following plants is forbidden unless accompanied by a certificate of health and the written sanction of the Director of Agriculture or the Chief Field Officer: Pará rubber (all species of *Hevea*), cotton (all species of *Gossypium*), sugar-cane, coco-nut seed nuts, living and growing palms of all species, oil palm (*Elaeis* spp.) seeds, all species of *Coffea*, except dried beans for consumption or trans-shipment, banana suckers for planting from all sub-species and varieties of *Musa sapientum*, *M. cavendishii* or *M. chinensis*, *M. paradisiaca*, and *M. textilis*, living plants and seeds of tea, and all living parts of pineapple excluding pineapple fruits from the Dutch East Indies for consumption or tinning.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, January to March, 1937.—pp. 24, 40–81, 1937.

Evidence having been furnished by the Latvian Government as to the absence from Latvia of potato wart [*Synchytrium endobioticum*] and other injurious diseases unknown or not widely prevalent in the United States, Latvia has been added to the list of countries whence potatoes may be imported into the United States [*R.A.M.*, xvi, p. 352] on production of an official permit.

Summaries are given of the plant quarantine import restrictions in force in Mauritius [ibid., xvi, p. 350], the Gambia [ibid., xvi, p. 351], U.S.S.R. [ibid., xv, p. 399], Argentina [ibid., xvi, p. 144], Hungary [ibid., vi, p. 192], Ceylon [ibid., iv, p. 191], and the Dutch East Indies.

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